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VOL. X. NEW YORK, JULY 23, 1887. No. 4.

MAYOR HEWITT, of New York, is of opinion that all the rules and regulations adopted by the Board of Electrical Control should be submitted for revision and approval to a competent electrical engineer. Mayor Hewitt is right, though the proposition is so self-evidently correct that it is strange there should have been any necessity to urge it.

IT is said that in Chicago all the motors have been ordered off the arc circuits. If such an order has been issued it is a mistake. One might as well order all the arc lamps off. Constant potential motors are given the preference by many on the score of safety, but it is easily within the compass of electrical skill to protect constant current motors.

THE very ingenious instrument designed by Dr. D'Arsonval for the determination of the speed of nervous impressions is, as he observes, well adapted to other work where a simple chronograph is needed. Once its error is determined, it remains practically uniform in its indications. It is somewhat to be regretted that Dr. D'Arsonval did not include in his article a few of the actual results obtained. It would have been interesting to compare the speed of transmission of a nervous sensation to the brain, and the reflex action, with the speed of electrical transmission. It is deserving of note, however, that the different sensations, such as cold, heat, pricking, pressure and the electric shock are transmitted with varying speeds.

ONCE more the cry is heard in New York that the poles are all going. Quoth one lively newspaper scribe: "They are all doomed now, and soon the festive woodchopper will be at work with his little hatchet," and it is quite possible that this authority approves of the holy work of George Addy, of Paterson, who chops down poles with linemen on them. However, the poles are not all "coming down with a run." Undoubtedly a large amount of underground work will be done and is desirable, but a great many of the poles will stay where they are. It is not at all unlikely that there will be as many poles in New York five years hence as there are to-day, in spite of an annual increase in the quantity of underground work done.

WHILE the method of incandescent lighting by means of lamps grouped in multiple series has thus far been confined, or rather limited, to arc circuits, the extent to which it may be employed is well shown in the system lately devised by Mr. Edison and described in another column. The principal object sought after in the new method is the maintenance of a constant difference of potential at divisional or distributing points in the series circuit. At the central station the potential may be carried as high as is deemed desirable, and thus the size of the series feeding conductor will be correspondingly decreased. At the same time the potential of the wires entering buildings is reduced to a safe point, so that accidental contact can cause no injury.

THE general activity in the electric light field continues to excite comment. The installation or ordering of new plants has hitherto slackened about May, but this year there has been little falling off, and the indications are that the fall season will be remarkably brisk. The fact is that the mere work of equipping new buildings and factories is alone sufficient to occupy the time and energies of a very large proportion of those engaged in the business; while outside that department is the central station work, in which, despite the prophecies that were freely made not long ago as to coming dullness, the growth was never equaled. Some of the largest central stations ever planned, arc or incandescent, are now under contract or in course of construction.

NEWS comes from Lockport, N. Y., that stray dogs impounded there are being killed by electricity "with promptness and dispatch." The apparatus appears to be simple. "A little dog was led out of the pound by a chain and considerately placed in a box, three feet by two, lined with tin, and with about an inch of water in the bottom. A muzzle with an innocent-looking wire, made to fit into the mouth, was placed on the cur by the pound-keeper. The executioner, by touching his hand to a lever, let go the electricity, and in a second little doggy was no more." Up to the date of the report, 25 dogs owe their taking off to this method, which corresponds to that proposed for capital criminals, and which might well be applied in the New York dog pounds, where the practices in vogue are not now very humane.

LONG-DRAWN out as have been the negotiations now popularly known as "the B. & O. deal," it is not yet certain that they are drawing to a close. It is true that Mr. Garrett is about to go to Europe and that a settlement is promised this week, but it is just as likely that the "deal" has already been made as that it is to be consummated now. The situation is undoubtedly important, for it involves not only the relationships of two such large railway corporations as the Pennsylvania and the Baltimore & Ohio, and two such telegraph corporations as the Western Union and the Baltimore & Ohio, but has direct bearing on the bitter and tedious cable war. Of late, reports have become so circumstantial as to affirm that the Commercial Cable has been sold for $10,000,000 guaranteed fives, or $8,100,000 sixes, and the Baltimore & Ohio Telegraph for $3,500,000; but the denials come as fast and thick as the rumors, and all Wall street is left wondering as to just what is the true state of affairs.

THE city fathers of Boston have made a trip of inspection through Eastern cities to see what has been done in underground work. If, as reported in the Boston papers, one of the committee on returning home said that in New York we "use a common wooden conduit in the street; it is practically a square box with cells called 'ducks' (sic) partitioned off from each other," it is to be feared that a committee was not selected that would do much credit to Boston culture and ability to make accurate observations. We are very much inclined to believe, however, that the newspaper man has wronged the alderman in this report. We read somewhere recently of a schoolboy who rendered *anas* as "high priest," but it requires greater misapplication of ability than that to make "ducks" out of New York subways, although perhaps the association between the costly subways and "ducks and drakes" is closer than at first glance is evident, especially as New York subways are not of plain wood but of special forms of concrete.

THE intention of English electricians to have a memorial celebration of the jubilee of the telegraph next week is highly proper and commendable, and there is no doubt that the banquet to be given will be extremely interesting and enjoyable. Such an occasion brings out very strikingly the immense advance made in electricity since the time of Wheatstone. Fifty years ago there were no electricians, for there was no science of electricity and practically no utilization of it; and much of what is known and employed to-day is due to the work of such men as Wheatstone. The vast advances made in electricity are well brought out in the handsome volumes which, with singular timeliness, were issued recently by the Smithsonian Institution, embodying the investigations and discoveries of Joseph Henry. A review of these writings will be found on another page. While there is little to be gained from bare assertions or admissions of priority in scientific work, it will, we think, please and even surprise many to learn from these volumes that Henry was so well to the front in his researches and applications. He was a worthy co-laborer with Faraday in a virgin field, and with him reaped some of its first fruits.

THE carbon industry has undergone some remarkable vicissitudes during the last month or two, and the various changes of front on the part of some of those interested have been at once startling and sudden. Three months have sufficed to bring to naught the combination organized by the manufacturers to keep up prices at what they considered a fair figure, and to-day a local company finds itself in about the same position as a purchasing consumer that it was last in March—in other words, it can go into an open market and buy all it wants on a competitive basis. Several events have tended to bring about this state of things, and not the least perhaps, of the causes of the dissolution of the combination was the resolve of some of the local companies to manufacture for themselves should no relief otherwise present itself. In fact, this alternative threatened from the outset, as did the possibility that other carbon factories outside the pool might be started, and that some of the parent companies might also etablish works in order to serve their own licensees. The rupture of the compact soon became inevitable, and it occurred last week when the Boulton Company sold an enormous quantity of carbons at rates greatly below the schedule of the pool, and when the Parker-Russell Company, proceeding on similar lines, quoted lower prices and said pithily, "We have decided that no one can attend to our business so well as ourselves." It cannot be said that matters have yet taken definite and permanent shape, but there is no reason why out of all this trouble a satisfactory settlement cannot be reached, insuring to the producer a living profit and to the consumer a good carbon at prices he feels he can pay. Is $12 to $15 a fair price for an honest article?

ON another page will be found an interesting description, by Mr. Grueninger, of a dynamo and the tests to which it was subjected in the transmission of power to a considerable distance in Switzerland. Perhaps the most striking feature in the construction of the machine will be found in the armature. In this, the wire, instead of being wound on the surface, is embedded in the iron of the ring, and the latter is thus brought in close proximity to the iron of the pole pieces. It might at first sight appear that this arrangement does not differ essentially from the mode of construction in which the wire is laid along grooves in the circumference of the armature, so that the latter has the appearance of a gear wheel. It is true that it makes little difference whether the cross-section of the armature is diminished directly on the surface, or somewhat deeper in the interior by the insertion of the copper winding. This similarity, however, is only apparent, and the difference is only brought out when the machines begin to generate current. In the machine described, the wire is distributed in a perfectly uniform manner, and we might therefore conceive that the arrangement is similar to one in which an iron core is surrounded by a shield or sleeve of less conducting material, such as bad cast iron. The latter, however, will exert no periodic changing influence upon the magnet field. It is different, however, with the machine in which the wires lie in grooves, with projecting teeth. The intensity of the magnetic field is subjected to regular variations dependent upon the relative position of the teeth and the pole pieces. In consequence of this, induction currents are set up, both in the coils and in the iron of the magnets, which affect considerably the operation of the machine. This evil was sought to be overcome by casting deep grooves in the pole pieces, but this introduced other defects, so that the use of armatures—of the Siemens type—with projecting teeth may be said to have gone almost out of use. While in both forms of machine it is sought to bring the iron of field and armature in as close contact as possible, the new type more successfully obviates a difficulty heretofore met with in practice.

NEW BOOKS.

ELECTRICITY TREATED EXPERIMENTALLY, FOR THE USE OF SCHOOLS AND STUDENTS. By Linnaeus Cumming, M. A. New Edition. New York. 1887. D. Van Nostrand. 7 × 4¼ in. 389 pp. Price, $1.50.

This new edition is timely in that the book, now well known, presents the matter in a form easily assimilated by the student. The lessons contained in it are educational, not technical, but nevertheless, in every part of the subject, quantitative measurement has been kept in view and attention has been directed to the absolute system of measurement.

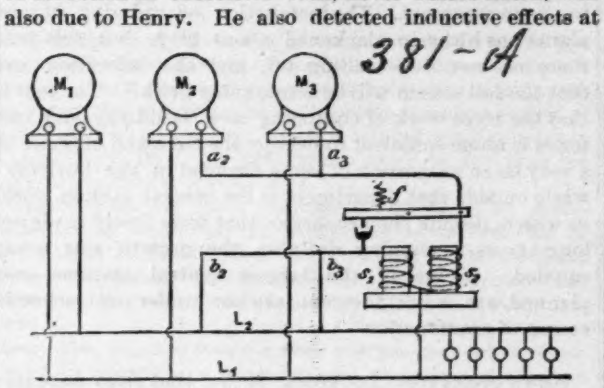
PRACTICAL DIRECTIONS FOR WINDING MAGNETS FOR DYNAMOS. By Carl Hering. New York: E. & F. N. Spon. 63 pp., 5 × 7½ in. Cloth. Price $1.25.

This handy little volume consists in the greater part of the articles by the same author which appeared in these columns during the past year. They have, however, been carefully revised and in some places enlarged by Mr. Hering, and in their present form are a valuable guide for the practical dynamo builder so far as the magnets of the machine are concerned. The author presupposes that the frame and armature have been determined, but that the calculation of the winding may show errors or poor proportions in the iron parts. He treats in this way the three principal types of machines, series, shunt and compound, and shows how with a given mass of iron the best results can be obtained in winding the magnets.

While the most modern theory of the dynamo and the calculation of its elements are based on the consideration of the magnetic resistance of the iron, it will be a long time before that method of design comes into general use, and, while at present the expert can employ it, the larger number of "practical electricians" will turn to a more simple method. For the latter, Mr. Hering's little volume will prove most interesting and valuable, and its appearance is welcome.

SCIENTIFIC WRITINGS OF JOSEPH HENRY. 2 Vols. Washington. Published by the Smithsonian Institution.

While the celebrations in commemoration of the fiftieth anniversary of the telegraph, and the advance in electrical science generally, are in progress in England, and the great names of Wheatstone, Cooke and Faraday are on the lips of all, it would seem no more than fitting that we should recall what America did for early electrical science in the past decades of this century. We can best do this by contemplating the work of a man who easily takes rank as one of the greatest philosophers America has produced, but whose investigations, owing to peculiar circumstances, are not known by the scientific world at large as they should be. We refer to Joseph Henry, who during more than half a century carried on his researches with unabated vigor, and through whose efforts the Smithsonian Institution has risen to the honorable and important position it now occupies. We have said that Henry's work is not as well known as it ought to be, and that this is the fact is but too evident, for not until within a few months since have his writings appeared in collected form. Before that time they were scattered through a large number of publications, possessed by few public libraries. Called to the directorship of the Smithsonian Institution in 1847, and laboring there for 32 years, Henry, nevertheless, abstained from publishing any of his work in the "Contributions" or "Miscellaneous Collections" of the Smithsonian Institution. While Henry's modesty and reluctance prevented him from circulating his ideas and results at the expense of the institution with which he was connected, his memory has at last been been done justice in the publication of his principal scientific writings during the past year. Without going into other wide fields of research explored in numerous directions by Henry, we find in his electrical work enough to attract our attention, and to make a review of it at this period eminently timely. Probably the first important electrical work accomplished by Henry was the remarkable extension which he gave to the power of the electro-magnet, discovered by Sturgeon, and the only one in existence when Henry began his work in 1828-29-30. Henry succeeded in raising the armature attraction from 9 pounds to 750 pounds in 1830, to 2,300 pounds in 1831; and to 3,500 pounds in 1835. He effected this by greatly increasing the ampère turns around the magnet by employing *for the first time* silk-wound or *insulated* copper wire of good size closely coiled; and by the use also of a series of coils placed around successive portions of the magnet. Sturgeon, it will be remembered, had wrapped naked wire around an insulated magnet. Henry called this magnet with the multiple coils a "quantity-magnet" to distinguish it from the "intensity-magnet," in which the entire coil was a continuous length of fine wire. The latter he pointed out was suitable for an intensity battery of numerous cells in series, as it required more electric "projectile force" on account of the high resistance of the magnet, while the quantity magnet required a battery of large surface. Henry thus was the first to recognize the fact, and to make a magnet capable of being excited at a great distance from its battery. He publicly announced in January, 1831, that the same was directly applicable to the project of an electro-magnetic telegraph, and in 1832 he showed a working model embodying the idea. Henry's work, indeed, had a very direct application in the telegraph of Morse, who, in his early work was ignorant of what Henry had accomplished before him, and who profited considerably by it later on. Henry also pointed out the method of obtaining powerful effects at a distance by causing the "intensity" or high resistance magnet in the main line to interrupt the local circuit of a powerful "quantity" magnet placed at the distant end of the line. This was later developed into the relay and local circuit by Morse. It is, therefore, remarkable that Wheatstone, in 1837, that is, six years later, should have announced: "I at once told Mr. Cooke that it would not, and could not, act as a telegraph, because sufficient attractive power could not be imparted to an electro-magnet interposed in a long circuit." And yet a year later Wheatstone substantially claimed the invention of Henry's "intensity magnet." Whether or not Faraday had seen the description of Henry's "quantity magnet" published in 1830, it is nevertheless a fact that he used the same peculiar form of magnet in his first celebrated experiments on induction in 1831. Indeed, Faraday's and Henry's works were for a number of years closely allied, and, as Prof. Mayer has said in relation to the discovery of magneto-electricity, Henry must be considered "its second independent discoverer." The minds of both these men were so fertile and their characters such as to make any other conclusion impossible. Neither of them mentions the other in the first experiments on the subject of magneto induction, but Henry subsequently mentions the fact that Faraday had arrived at the same results a few months before, but of which he knew nothing. To Henry, however, belongs the unquestioned honor of the discovery, in 1832, of *self-induction*, in a long wire and in coils, which Faraday rediscovered in 1834. Henry's work on induction is especially interesting at the present time, when the induction coil is coming into such extensive use in connection with electric lighting. For we read that "the important fact is shown that not only a current of intensity can be induced by one of quantity, but also the converse—that a current of quantity can be produced by one of intensity." The observation of secondary, tertiary and higher orders of induction in successive coils, never before noted, was also due to Henry. He also detected inductive effects at



SIEMENS METHOD OF COUPLING ALTERNATING MACHINES.

extraordinary distances, such as the magnetizing of needles in the cellar from a single spark in the attic, or in his study window from a lightning flash at a distance of several miles!

To him is also due the discovery of the "oscillation" of an electric discharge (1842), which interesting phenomenon was subsequently re-discovered by Helmholtz in 1847; and later, and independently, by Sir Wm. Thomson in 1852. Nor must we forget to mention the fact that Henry was the first to construct an original type of electric motor in this country in 1831. We might continue to enumerate the many important and interesting investigations followed by this great philosopher and brought out in these volumes, but what has already been said will suffice to show that though hardly recognized to its full extent at the present time, Henry's work will in the future be more and more appreciated. This end will be largely brought about by the convenient and fitting shape in which his writings are now available. To the Smithsonian Institution is due the credit of placing permanently on record in collected form work which will be classical for all times.

The Siemens Method of Coupling Alternating Current Machines.

When it becomes necessary to add an alternating machine to a circuit which is already fed by another alternating machine, the operation is somewhat difficult on account of the necessity of having both machines in the same phases; or in other words, that the alternating impulse shall be given simultaneously in both machines. If, for instance, the second were thrown in at any time by an ordinary commutator, the phases would probably not coincide. Before synchronism could be established, there would necessarily be a falling off in the current due to the fact that the machines oppose each other, and hence a dimming of the lamps takes place.

In order to avoid this difficulty, Messrs. Siemens and Halske have devised the arrangement shown in the accompanying illustration. M_1 is the operating machine, and M_2 and M_3 the machines to be thrown into circuit; L_1 and L_2 being the conductors leading to the lamps. An electro magnet is arranged as a shunt to the machine in such a way that the one leg S_1 is energized by the current from the machine M_1, and the leg S_2 by the current from the machines M_2 and M_3. It is evident that as long as the phases of the machine do not coincide absolutely, the magnetism developed in the electro-magnet will not be the maximum. The force of the spring F cannot be overcome, and the armature will not be attracted except when the three machines act in unison; that is to say, when their alternate phases coincide. At this instant the armature is attracted, and, as the illustration shows, the shunt is closed and the machines M_2 and M_3 are thrown into the circuit of the lamps.

The American Institute Electrical Exhibition.

The New York Electrical Society, which is giving the electrical exhibition this Fall at the American Institute, Third avenue and Sixty-third street, has now issued its forms of application for space. It will be remembered that the society has already received preliminary applications for about 10,000 square feet of floor space and over 500 h. p., and pledging the exhibit of over 2,000 incandescent lamps, 150 arc lamps, about 250 motors, several storage batteries and three electric railways, besides a great number of miscellaneous inventions and manufactures. This in itself would constitute a magnificent and interesting display, well worthy of the society and the science it represents locally, but as new applications are received daily, the indications are that the electrical exhibit will be one of the finest and most varied of the kind ever seen in this country. This is hardly surprising, however, in view of the fact that the annual show of the American Institute draws regularly about 500,000 people, and that New York is not only very accessible for distant manufacturers but is itself the home of a large number of electrical industries. In addition to this the terms for space are remarkably low, and no charge is made for steam.

The society has made a classification of the exhibits as follows, in six sections:

SECTION I.—PRODUCTION OF ELECTRICITY.

1. Dynamo and magneto electric machines.
2. Primary batteries.
3. Thermo electric apparatus.
4. Static electric apparatus.

SECTION II.—APPARATUS REQUIRING POWERFUL CURRENTS.

1. Electric motors and transmission of power.
2. Electric railways.
3. Storage batteries.
4. Electric illumination.
5. Electro-metallurgy and electro chemistry.
6. Miscellaneous applications of powerful currents.

SECTION III.—APPARATUS REQUIRING COMPARATIVELY WEAK CURRENTS.

1. Fire and burglar alarm, annunciators, watchman's time detectors, electric bells, etc.
2. Electric telegraphs, telephones, microphones, photophones and radiophones, and other apparatus for electrical communication.
3. Electric registering and signaling apparatus.
4. Applications of electricity to the mechanic arts.
5. Applications of electricity to heating and ventilation.
6. Electric clocks and time telegraphs.
7. Electro medical apparatus of all descriptions.
8. Applications of electricity to writing and printing.
9. Electrical toys.
10. Miscellaneous applications of small currents.

SECTION IV.—ELECTRIC CONDUCTORS.

1. Electric light and power conductors.
2. Telegraph and telephone wires and cables.
3. Insulating materials, electrical joints and connections.
4. Electric underground wire systems.

SECTION V.—ELECTRICAL MEASURING APPARATUS.

1. Voltmeters and ammeters.
2. Galvanometers, rheostats, etc.
3. Condensers, switches, keys, etc.

SECTION VI.

1. Historical and miscellaneous exhibits.
2. Educational and bibliographical.

The Society has also appointed the following special committees for attending to various details of the work:

COMMITTEE ON FINANCE.—Francis Forbes, Frank W. Jones, George G. Ward.

COMMITTEE ON SPACE.—A. C. Fowler, W. C. Temple, R. W. Pope, C. G. Curtis, G. M. Phelps, Jr.

COMMITTEE ON TRANSPORTATION.—George Worthington, Ch. L. Levey, W. A. Vail.

COMMITTEE ON ELECTRICAL INSTALLATION.—C. O. Mailloux, J. A. Seely, C. S. Bradley, A. A. Knudson, H. L. Waite, George A. Hamilton, J. A. Barrett, C. L. Clarke, C. L. Edgar.

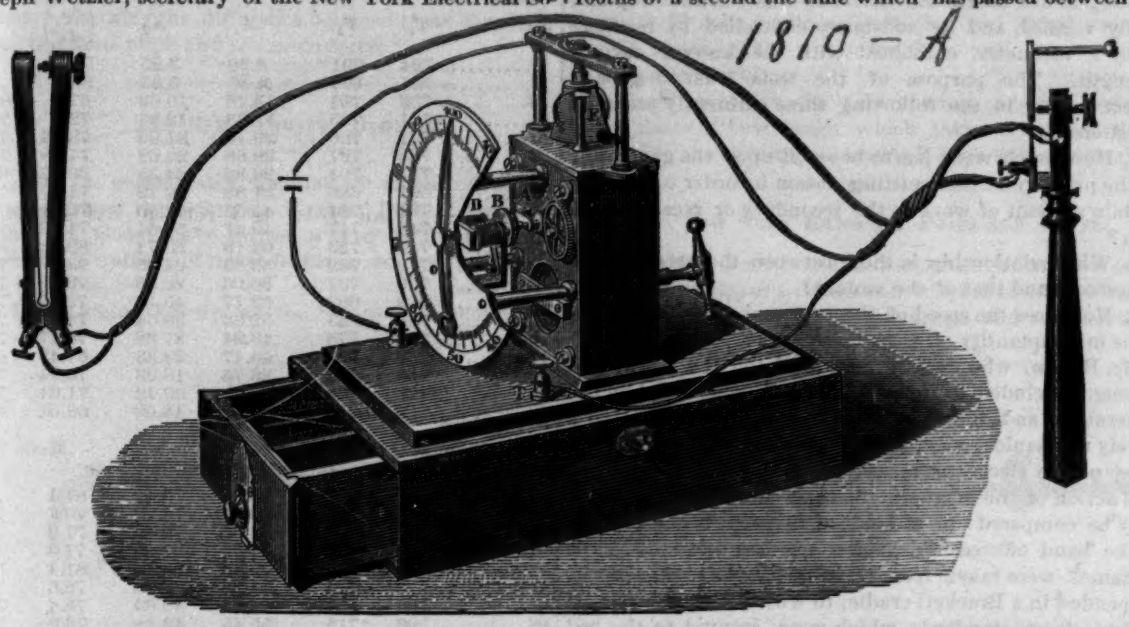
COMMITTEE ON ENTERTAINMENT.—A. A. Knudson, Dr. Vander Weyde, H. A. Sinclair, T. A. Edison, Dr. Otto A. Moses, E. C. Davidson, Prof. A. M. Mayer, James A. Hamblet.

COMMITTEE ON EXHIBITS.—Dr. M. J. Roberts, Dr. Otto A. Moses, George A. Hamilton, M. M. Davis, T. Wolcott, Alf. Shedlock, A. A. Knudson, C. O. Mailloux, S. S. Wheeler, W. B. Van Size, J. F. Kelly, F. B. Herzog, Wm. Hochhausen, Leo Daft.

COMMITTEE ON CORRESPONDENCE AND PUBLICATION.—Alf. Shedlock, C. E. Stump, Dr. Vander Weyde, G. M. Phelps, Jr.

COMMITTEE ON HISTORICAL APPARATUS.—Dr. P. H. Vander Weyde, J. A. Hamblet, A. G. Holcombe.

The work of preparation is now going on actively. Any information required can be obtained on application to Mr. Joseph Wetzler, secretary of the New York Electrical Society, room 175, Potter Building, New York City, or Mr. C. W. Hull, Superintendent of the American Institute, Clinton Hall.



CHRONOMETER FOR MEASURING THE SPEED OF NERVOUS IMPRESSIONS.

An Electric Chronometer for Measuring the Speed of Nervous Impressions.

BY DR. A. D'ARSONVAL.

This instrument, which I presented some months ago to the Biological Society, fills a want in the clinic of nervous diseases. Its object is to measure, in a simple and direct manner, the speed of nervous action. This measurement was accomplished for the first time by Helmholtz by means of the graphic method, using a registering cylinder covered with lampblack with a tuning-fork chronograph. Marey and his pupils simplified this method by using blackened paper and the tuning-fork alone. This method, while excellent in the laboratory, is absolutely impracticable at the side of the patient.

My instrument is based on an entirely different principle. It gives directly on a dial the measurement sought, expressed in 100ths of a second on a chronometer provided with a pointer. It consists essentially of a clockwork which, with a simplified regulator of the Foucault type, imparts to a spindle a uniform speed of rotation of one turn per second. Another spindle has a small disc *B* at one end, and passes through a dial divided into 100 equal parts. The other end of this spindle carries a pointer which moves over the divided dial.

These two spindles are absolutely independent as long as a sufficiently strong electric current passes through the small electro-magnet *D* placed behind the dial. This magnet, when energized, pulls back a small disc *B*, of soft iron at the end of the second spindle; if, on the contrary, the current is interrupted, the soft iron disc is thrown forward by means of a spring and makes contact with the disc attached to the spindle of the clockwork. The two spindles are thus instantly connected and the pointer moves round the dial at the rate of one turn per second. The operation of the instrument is thus very simple.

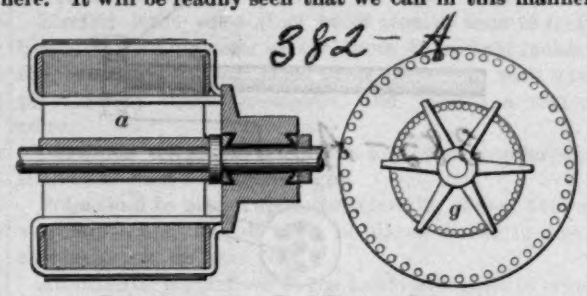
In order to measure a very short space of time it is therefore only necessary to arrange it so that the beginning of the phenomenon breaks the current and that its end starts the same. At the instant that the phenomenon begins, the pointer starts to the right at the rate of one turn per second, and stops at the instant the disturbing force ceases. To ascertain the exact duration of the phenomenon, therefore, it is only necessary to read the number of divisions passed over by the pointer. We have then the time, expressed in 100ths of a second. By giving the clockwork a greater speed, the same might also be read in 1,000ths of a second.

It is important to reduce to a minimum the time lost by the instrument itself, *i. e.*, its error. I have accomplished this by first making all the movable parts as light as possible, and by employing for the electro-magnet one of those small pieces of apparatus used in the electro-magnetic signal of Marcel Deprez and Sebert.

However, the loss in the instrument itself, which is almost negligible, is of little importance, provided it is constant, since the apparatus is not employed for absolute measurements, but merely as one of simple comparison.

In order to adapt the instrument to the measurement of nervous sensations it suffices to add to it two very simple, small instruments, shown at the side of the chronometer in the illustration. The first, that to the right, is held by the physician; the second, that to the left, by the patient. The latter, closing his eyes, the physician touches him at a point on his body which it is desired to explore. At the instant that the contact is made by the small knob, the pointer of the chronograph starts because the contact is interrupted at the end of the screw, as will be clearly seen from the illustration. When the patient feels the touch he closes the vice at the left, re-establishes the current and so stops the pointer. Upon the dial can, therefore, be read in 100ths of a second the time which has passed between the instant the patient has been touched by the physician and the instant in which he becomes aware of the touch.

I will not here enlarge upon an analysis of the intermediary phenomena which constitute the reflex action; this is a purely physiological analysis which does not concern us here. It will be readily seen that we can in this manner compare very readily the speed of sensation at the different points of the body, and thus determine whether the two halves of the body are alike in this respect. We can thus determine if the spinal cord is normal or diseased, where the diseased point is, etc.



FIGS. 2 AND 3.—THE BROWN DYNAMO.

The same can be done with the nerves. We can establish a diagnosis of nervous disease and follow its progress as well as the action of the medicines employed. It is very easy by means of this instrument to detect persons who simulate nervous disorders of movement or sensibility, as is frequently the case with hysterical persons. It might be said that with the aid of this instrument the clinical demonstrator studies the lesions of the nervous system, and localizes them as the electrician localizes the faults in a telegraph line.

I have undertaken, by means of this method, both alone and in connection with Mr. Brown-Séquard, a series of researches, which have already given me very interesting results, from the standpoint of the different causes, physical or moral, which greatly modify the condition of our nervous centres.

I might add that this little instrument, which is easily manipulated and is very portable, can be well applied in measuring all phenomena of short duration. The different sensations produced by pressure, heat, pricking, cold, electricity, are all transmitted at different speeds. Some nervous diseases, when increased, cause others to disappear. It is sufficient for me to indicate these facts, in order to show to what a large number of researches can be applied this little instrument, which owes its entire value to the agency of electricity.—*La Lumière Electrique.*

Electrical Transmission of Power by the Oerlikon Dynamo.

BY OTTO GRUENINGER.

A number of more or less elaborate accounts of an extremely successful electrical transmission of power in Switzerland have recently appeared in several foreign journals, and THE ELECTRICAL WORLD has also contained a short notice on the subject. The transmission in this case is not a mere experiment but serves for every day industrial purposes, and as many similar applications could unquestionably be made with like satisfactory results, it may not be without interest to some of your readers to obtain a more extended description of the plant, its details and the tests which were made. Electrical transmission of power is daily gaining in practical importance, and every improvement and step in advance of satisfactory economical solutions deserves to be carefully watched.

The contractors and builders of the installation are the well known Oerlikon Machine Works, near Zurich, Switzerland, a firm of European reputation, and Mr. C. E. L. Brown, the head of the electrical department, designed the dynamos which have given such excellent results. Painstaking tests were made at the Oerlikon Works by a number of scientists and engineers. Prof. Amsler-Laffon, the famous inventor of the polar-planimeter, and the still more ingenious integrator, or moment-meter, prepared a minute report on the tests, and upon this, as well as several statements by Mr. Brown himself, the following data are based.

The solution of the problem called for the transmission of a water-power from Kriegstetten, varying between 30 and 50 h. p., to Solothurn, a distance of about 8 kilometres (5 miles). Special stress being laid upon the greatest possible certainty of operation of the plant, Mr. Brown decided to employ two generators and two motors so dimensioned that in case of emergency one pair alone would be able to do the principal part of the work. The number of revolutions was fixed at 700 for all the machines, thus keeping the cost of dynamos and their wear and tear within proper limits. To lessen the expense for conductors and the loss of efficiency through line resistance, a tension of from 2,000 to 2,500 volts was adopted. The dynamos work in series and each gives therefore from 1,000 to 1,250 volts.

The illustration, Fig. 1, shows the external appearance of the machines, both generators and motors being similar in construction; they differ, however, in some of their

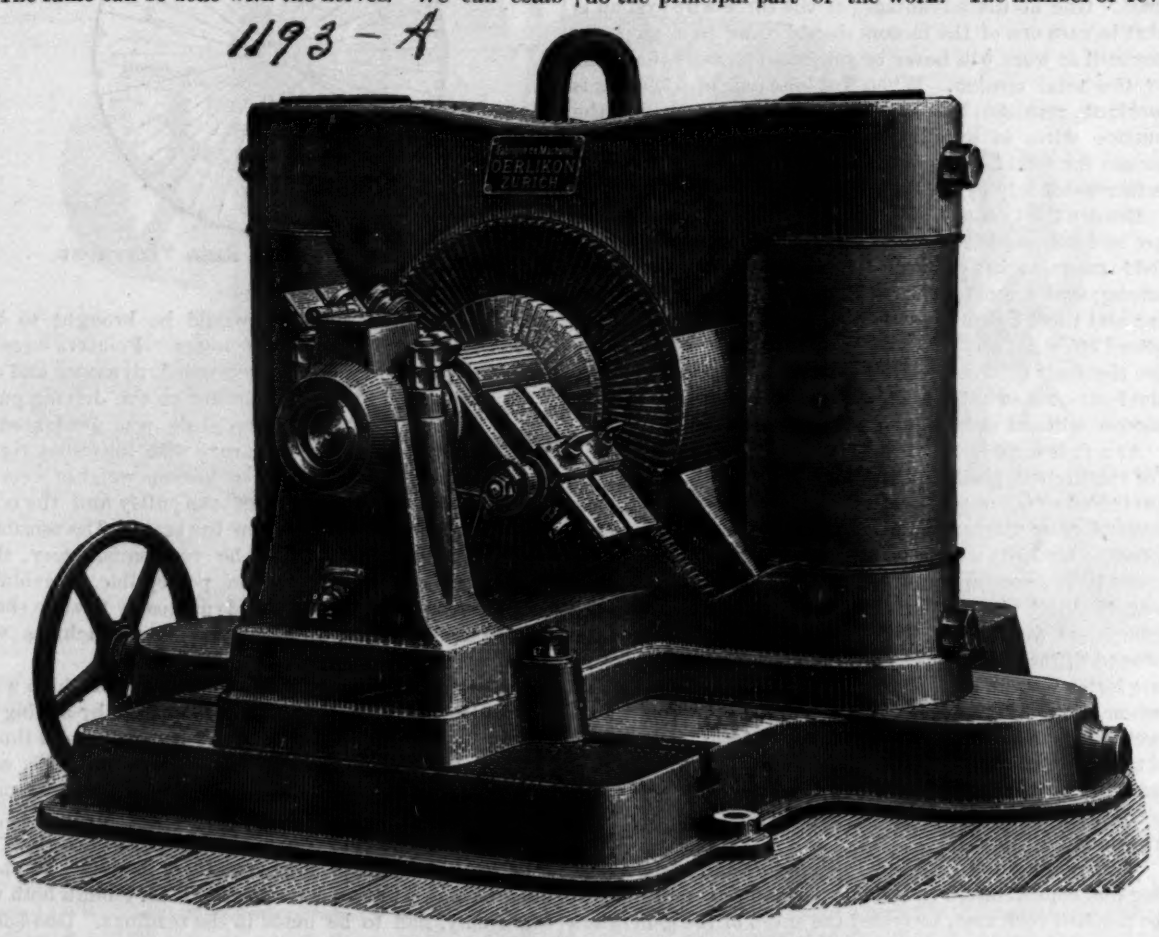


FIG. 1.—THE BROWN (OERLIKON) DYNAMO.

proportions and in the winding. The field magnets are formed of two vertical pillars of wrought iron, which are united above and below by cast-iron pole pieces, the pillars simply fitting into borings in the latter. The lower pole piece is cast in one piece with the two supports for the armature. The driving pulley (not seen in the cut) is inside the armature bearing. The dynamo frame instead of being bolted to the floor fits in a slide rest on a firmly secured bed-plate, and by turning a hand-wheel the tension of the belt may be varied at will while the machine is in motion. The exciting bobbins of the field magnets are wound separately on spools which slide easily over the wrought iron cores. The whole construction is exceedingly simple, compact and neat.

The principal novelty, however, is to be found in the peculiar construction of the armature. The latter is a modified Pacinotti-Gramme ring with an unusually large iron section; but, departing from the customary method of placing the windings or conductors on the surface, Mr. Brown places them in special borings immediately *below* the surface of the armature. Figs. 2 and 3 represent the arrangement for a Gramme ring, and it will be noticed that the sections of the windings in the armature immediately below the surface may be comparatively large, thus counteracting their comparatively confined position for radiation, and making it possible that the same number of conductors can be obtained outside and inside. It is obvious that with the conductors entirely inside the armature the latter can be run exceedingly close to the pole pieces; the air-space between armature and pole pieces is reduced to a minimum, and the conductors move through a most intense magnetic field.

Practical tests with the machine have given some remarkable results. One of the first experimental machines with 12 kilogr. (26½ lbs.) of wire on the armature (resistance 0.008 ohms.) and 33 kilogr. (72¾ lbs.) of wire in the field (resistance 25 ohms) yielded, at 1,000 revolutions per minute, 65 volts at the terminals and a current of 160 ampères. In the present case of transmission of power, the dynamos are of much larger size. The armature has a diameter of 20½ inches and a length of 12 inches. The electrical data are as follows:

	Diameter of wire.		Resistance.	
	Armature.	Field.	Armature.	Field.
Each generator....	2 mm.	4 mm.	1.40 ohms.	2.07 ohms.
Each motor.....	2 mm.	4 mm.	1.30 ohms.	1.95 ohms.
Total resistance of both generators..	2 (1.40+2.07) = 6.94 ohms.			
Total resistance of both motors.....	2 (1.30+1.95) = 6.50 ohms.			

For the line Mr. Brown chose the three-wire system. Bare wires, all of uniform size, 6 mm. diameter, of chemically pure copper, are supported on poles 130 feet apart. At one spot the river Aare is crossed in a single span of 395 feet. Here the copper is exchanged for wires of silicium bronze of the same size, equal conductivity and at least double the tensile strength. Fluid insulators are used. One of the advantages of the three-wire system is that in case one of the motors should come to a stop the one still at work will never be subjected to more than half of the total tension. When but one pair of dynamos is working, provision has been made to connect one of the outside wires in parallel with the central one, by which means the total line resistance, instead of being doubled, is increased only by one-half.

Besides the two generators at the primary station there are two automatic shunts there for short circuiting the field magnets in case the current should become too strong; two ammeters show how the dynamos are working and three lightning arresters of peculiar construction afford effectual protection. The motors at the other station are similarly protected. They are also provided with two fluid cut-outs so as to admit of sudden stoppage of the motors without endangering the insulation.

As a first consideration the contract for the plant called for the highest possible uniformity of speed. Mr. Brown preferred to accomplish this by purely electrical means instead of by mechanical regulation. Three of the many possible methods which deserve special notice are: 1. The generators are compound dynamos while the motors are simply shunt wound. 2. Both generators and motors are compound wound, but the series wire of the motors is wound differentially. 3. The generators and the motors are series wound. The first one is especially commendable when the tensions are not too high; the second answers well when several motors are operated from one primary station. The third one, however, which Mr. Brown has adopted in this case, is excellently suited for high tensions and when there is but one receiving and one transmitting station.

With specially proportioned generators and motors paying due consideration to the line resistance, conditions can be reached such that, provided the speed of the generators be kept constant, the speed of the motors will also be uniform. Practical experiments fully sustained the theoretical conclusions, for when applying the brakes up to 20 per cent. beyond the normal power, the difference in speed amounted to only about 3 per cent., and even this difference might have been avoided, if absolutely demanded. An automatic shunt to one pair of the field-magnets—an easy means of establishing uniform working of the machines—has purposely been avoided; the entire regulation rests in the judicious design and proportioning of the dynamos themselves.

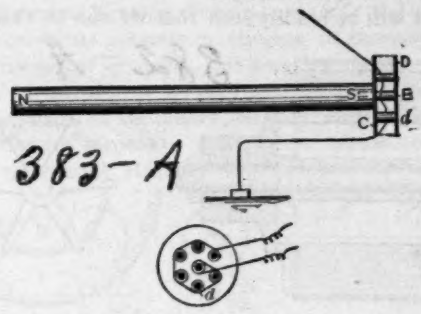
For the sake of convenience the tests were made at the works in Oerlikon under precisely similar conditions to those prevailing at Solothurn. The line resistance, amounting to about 9½ ohms, was replaced by an iron resistance of 10 ohms. This resistance, on account of its considerable heating under maximum currents, was continuously and easily verified, and its constancy controlled by readings from a voltmeter, combined with the known current strength. The purpose of the tests was to give a direct answer to the following three eminently practical questions:

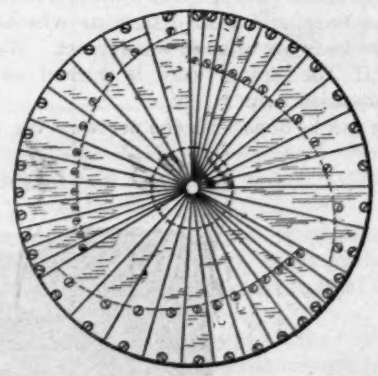
1. How much work has to be spent upon the generators at the primary or transmitting station in order to obtain a certain amount of work at the secondary or receiving station?

2. What relationship is there between the speed of the generators and that of the motors?

3. How does the speed of the motors vary with fluctuations in the quantity of work transacted?

Mr. Brown, who devised and arranged the method of testing, concluded to measure the power absorbed by the generators and the work given out by the motors in a purely mechanical way, so as to preclude any possible distrust of the electrical measurements by non-electricians. The action of the magnetic field on the armature which may be compared to a kind of invisible brake shoe or brake band offered Mr. Brown a means to do this. The dynamos were taken from their bed plates and each was suspended in a Brackett cradle, to which it was firmly attached, from standards which were secured to the bed plate. Provision was made to shift these standards when the belts had to be tightened. In this manner each dynamo formed a huge pendulum which, upon the armature revolving, would assume such a position that its statical moment would exactly balance the moment due to the acting force in the belt, plus (or minus in case of the





FIGS. 1, 2 AND 3.—A REED TELEPHONE.

motors) whatever influence would be brought to bear through frictional and other losses. Pointers were attached to the frames of the suspended dynamos and on a graduated scale the forces acting on the driving pulley could be read off directly. The scale was graduated by previously fastening the armature with the pulley rigidly to the dynamo frame, and then various weights were applied on the circumference of the pulley and the corresponding deflections marked on the scale. The sensibility of the apparatus proved to be very satisfactory, there being scarcely any lost motion perceptible. Revolution counters were attached to the dynamos by flexible shafts. Corresponding observations on the four machines were taken within the space of one minute.

The motors had to drive an electric light machine whose absorption of power could be increased by adding arc lamps. A very constant demand for power could thus be maintained, and one which could always be readily made to correspond with the power developed by the motors. When the primary dynamos made 100 revolutions, the motors commenced to respond and began to revolve.

Before giving the principal results of the trials, attention must be called to two corrections which, though both very slight only, had to be made in the readings. One had its origin in the magnetic attraction between the suspended dynamo frames, standard and bed plates. By special experiments its amount for various positions of the pointers was ascertained and the readings corrected. Another correction appeared necessary on account of the tension of the belt having the tendency to shift the cradle on the knife-edges. The very small error from this source was also determined and duly considered.

In the following table T_1 are the number of revolutions per minute of the generators, being practically identical for both machines; T_2 are the number of revolutions of the motors, both running also practically uniform; A_1 are the horse-powers absorbed by the generators, and A_2 are the horse-powers given out by the motors. A_1 and A_2 are calculated from the corrected readings of the pointers.

OBSERVATIONS MADE NOV. 29, 1886.

No.	T_1.	T_2.	A_1.	A_2.	$\left(\frac{A_2}{A_1}\right)$	Q.
1	724	691	4.30	3.25	75.8%	....
2	721	691	4.66	3.25	69.9	....
3	759	751	15.76	10.63	67.4	65.4%
4	731	725	17.73	12.91	72.8	72.9
5	731	726	29.73	21.92	73.74	73.9
6	733	727	29.68	22.08	74.38	74.7
7	711	704	36.86	24.58	66.67	65.9
8	697	685	31.83	22.72	71.37	71.2
9	731	724	44.53	32.10	72.08	72.0
10	742	747	49.47	36.64	74.06	74.2
11	719	723	32.13	25.74	80.13	81.0
12	719	720	33.63	24.88	73.98	74.2
13	730	731	36.06	26.28	72.89	72.9
14	685	682	62.17	45.12	72.57	72.6
15	739	743	52.63	39.04	74.18	74.3
16	766	773	48.94	37.28	76.17	76.3
17	739	737	43.47	29.33	67.47	66 4
18	755	753	26.75	18.93	70.74	70.4
19	726	722	28.51	20.42	71.61	71.2
20	716	710	26.37	18.09	68.61	67.8

Mean. 70.2%

ORSERVATIONS MADE NOV. 22, 1886.

21	722	684	8.32	6.69	81.1	....
22	715	715	20.37	16.22	79.7	79.1
23	715	714	32.95	25.42	77.2	76.0
24	723	723	34 96	27.01	77.3	76.2
25	715	715	39.69	32.32	81.4	81.1
26	741	743	43.33	33.20	76.6	76.0
27	702	711	56.61	42.69	75.4	74.5
28	706	715	55.45	42.18	76.0	75

Mean. 76.9%

Prof. Amsler-Laffon subjected the tests to a very exhaustive examination, down to the minutest details, and though he found that the ratio $\frac{A_2}{A_1}$ might at once be adopted as giving very closely the efficiency of the plant, he also showed in his report how all small losses and errors could be eliminated, and how the practical efficiency Q could be calculated. If A_1 and A_2 represent two corresponding values of any observation, and if A°_1 and A°_2 are the corresponding values when the minimum amount of work is transmitted (Nos. 1 and 2 of the table give $A^\circ_1 = \frac{4.30 + 4.66}{2} = 4.48$, and $A^\circ_2 = 3.25$), then we find that $Q = \frac{A_2 - A^\circ_2}{A_1 - A^\circ_1}$. The values of Q in our table represent then the actual commercial efficiencies.

The mean of all the observations from Nos. 1 to 20 is 70.2 per cent. If only Nos. 9, 10, 14, 15 and 16 are considered, *i. e.*, those cases in which more than 30 horse-power were transmitted, then the average efficiency is 73.9 per cent. It is a little higher, viz., 76.9 per cent. in Nos. 21 to 28. The reason is that while on Nov. 22 each of the generators absorbed nearly its full share of the total work, on Nov. 29 they differed in their work at times by 50 per cent. and more. This would call the central line wire into action and thereby increase the line resistance by a few per cent.

In the above table but a small portion of all tests are recorded. Many more were made and with all of them the commercial efficiency is between 70 and 80 per cent. It is especially to be noted that even when but small powers are transmitted the efficiency is quite high.

On the actual line between Kriegstetten and Solothurn, where the line resistance is smaller and the journals have worn to a polish, the efficiencies are somewhat higher.

It will be of interest to add to this the ratio, in round numbers, of current to tension, the latter measured at the terminals of the motors:

Ampères.....	1	2	4	6	8	10	12	14
Volts.....	250	450	650	800	900	1,000	1,100	1,200

The volts have to be doubled as the motors work in series. These figures at once explain the high efficiencies under such varying amounts of work. When starting, the ratio of tension to current is very high, consequently the losses due to resistance are small, and the extra currents are of little account, but the frictional losses are comparatively large; when working under full load, however, the ratio of tension to current is smaller and the extra currents are stronger, but now the frictional losses are of less importance.

A Reed Telephone.

In order to obtain a perfect reproduction in the telephone receiver of the sounds conveyed to the transmitter, Mr. A. G. Safford, of Washington, D. C., has devised a form of receiver which is constructed so that the modulations which would be lost in a telephone having a single diaphragm are brought out. He accomplishes this by means of a set of reeds tuned to different pitches and acted upon by a series of magnets around which the current passes. The accompanying illustrations, Figs. 1, 2 and 3, show the manner in which the idea is carried out. Behind each of the reeds there is placed a magnet and the wire is wound successively around all of them. The reeds are constructed and attached to the frame, so that they may have different rates of vibration, one or more reeds being tuned to each vibration. Altogether, they represent at least one reed for each semitone of an entire octave of the diatonic musical scale. As thus constructed, according to Mr. Safford, the reeds respond very readily to all sounds or to all electrical impulses having the same rate of pul-

sation as to the rate of vibration, which determines the pitch of sounds, acting upon the familiar principle of co-vibration or sympathetic vibration, besides producing those overtones which give the characteristic quality or *timbre*, marking the difference between those sounds having the same pitch and the same force.

The New Schuyler Dynamo.

After a considerable amount of experimenting and improvement the Schuyler Electric Light Company, of Hartford, Conn., have devised a type of dynamo which presents a number of novel features, adding considerably to its value.

The machine, known as the "type 5," is shown in the

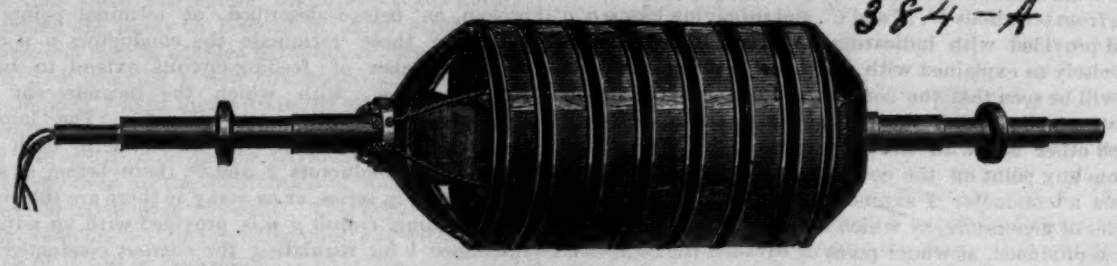


FIG. 1.—ARMATURE OF NEW SCHUYLER DYNAMO.

accompanying illustration, Fig. 2, and, as will be seen, consists of only three parts, the top and bottom field magnets and the armature. The bottom field is firmly secured to two wooden planks, which carry the terminals and switch, including also the bearings for the armature shaft. The bottom field, as well as the top, is of cast-iron, with the best soft iron shanks, the former being cast around the latter and then carefully annealed. The self lubricating bearings are a distinct feature. They have stood the test of nearly three years' running, and have given general satisfaction to all those who are using them.

The shaft of the armature is provided with two collars, as shown in Fig. 1, which regulate the end play and revolve in two large oil tanks. By rotation the oil is continually carried around, and by a wedge-shaped wiper, seen at the top of the box, distributed in the oil channels extending over the whole bearing surface. The oil, after having passed through the journal, gathers in the bottom of the tank and is raised again. A drip-cup underneath, furnished with a valve, allows the sediment to settle and be removed. Actual experience has shown that bearings of this description have worked satisfactorily with an attendance of only once a week. The top field, constructed like the bottom field, is connected to the latter by only four bolts.

The armature winding consists of four coils, two and two respectively, forming one system, each having its independent commutator. The two systems being coupled permanently in series, their respective resistances may vary any amount without disturbing the electrical balance. It is only necessary to balance electrically the two coils forming part of one of either system. Each one is entirely cut out of the circuit twice during each revolution, while it is delivering practically no current. The great advantage of this construction is that it allows the armature to be wound for thorough ventilation.

The core of the armature is hollow with an opening at each end, and two coils of one system are first wound around on the coil directly, while the second system is made to overlap the first, thus leaving a large air space. This insures good insulation between the points where the difference of potential is the highest. The coils act at the same time like a fan, forcing the air through the body of the armature and expelling it at the back.

The eight ends of the four coils are connected to a slate ring and thence cables run through the hollow shaft to the slate commutator. The latter consists of a slate body with eight copper segments fastened thereon, the segments being all made by a jig and therefore interchangeable; so that to change segments or even the whole commutator is a matter of but a few minutes. The insulation being very high and non-combustible there is no danger of short circuiting the coils.

For the collecting of the current eight brushes are used, which after being once set require no further alteration for weeks.

The peculiar construction of the armature allows of only one half of it being run, if necessary, so that even in case of an accident resulting from abnormal causes, a part of the machine might yet be utilized.

The field magnets are coupled between the two armature windings so that the strain on the insulation of the armature amounts to only one-half the total E. M. F. in case the field magnets should be accidentally grounded.

The following are the principal data relative to the machine:

Weight	3,652 lbs.
Floor space	81 x 25 in.
Revolutions per min	850
E. M. F. at terminals	2790 volts.
Current	9 amp.
Armature resistance (warm)	12.9 ohms.
Field magnet resistance (warm)	13.3 ohms.
Electrical efficiency	92 per cent.
Commercial efficiency	85.6 "

The weight of the armature is 152 pounds and the total weight of copper in the fields is 583 pounds.

The total output at standard speed is, as shown, 25,110 watts. Each arc lamp of the Schuyler system takes 450 watts (50 volts 9 ampères), which gives 50 full arc lamps and leaves 2,610 watts for lines and some additional lamps on short line.

Each machine is accompanied by an automatic regulator of new design, which takes care of all fluctuations in the current and brings it back to the normal.

New York Rules for Poles and Wires.

The New York Board of Electrical Control met on July 15 in the Mayor's office, and adopted the following rules governing the erection of telegraph and telephone poles and wires, which had been approved by General Newton, Commissioner of Public Works:

No two lines of poles shall be on the same side of any street or avenue.

No two lines of poles bearing conductors for similar electrical service shall be on any street or avenue.

Electric light poles shall be of iron, at least 26 feet in height, with a diameter of not more than eight inches at the base, and having cross arms of wood, with glass, porcelain or rubber insulators, and painted a uniform color.

Poles for telegraph, telephone and other similar wires shall be at least 60 feet in height.

Poles shall be placed upon the sidewalk, as near the curb as possible, and no pole shall be placed within 10 feet of any lamp post or other pole.

All existing regulations of the local authorities in regard to the placing of poles and stringing of wires are to continue in force.

All wires shall be fastened upon poles or other fixtures with glass, porcelain, or rubber insulation.

No wires shall be stretched within one foot of any pole without being attached to the same with glass, porcelain or rubber insulation.

No wires shall be stretched within 20 feet of the ground or within 4 feet of any building, except when attached thereto with glass, rubber or porcelain insulation.

No arc electric light or power wires shall be stretched over any part of any house or other building

The companies or persons owning or controlling poles in any street or avenue shall allow the same to be used by other companies or persons operating conductors for similar electrical service when authorized so to do by the board on tender of proper compensation, to be determined by agreement between the companies or persons interested. In default of such agreement, the amount of such compensation shall be determined by the board. This rule imposes a contract on the part of each company or person owning or controlling the poles in any street or avenue, not only with the board, but also with each company or person who shall under its terms be qualified to demand the privileges it confers.

All permits of the board for overhead wires and fixtures are granted only pending the providing of underground accommodations in the neighborhood of the street or avenue for which the permit is granted.

Any member or officer of the board, and every inspector employed by it, as well as every member of the police force of the city, shall be entitled to examine permits under which work of any kind is being done.

No permit shall be granted for the erection of any overhead structure nor for the renewing of any lines already existing in any street, avenue or highway in which underground accommodations for the service have been provided or are being provided.

All poles now standing or to be hereafter erected shall be branded or stamped with the initials of the company owning them, at a point not less than 5 or more than 7 feet from the street surface.

When an old pole is taken down it must be removed from the street the same day.

New poles must not be brought upon any street more than two days in advance of their erection.

Any pole that shall be on any street more than two days shall be removed by the Bureau of Incumbrances of the Department of Public Works at the expense of the party owning it.

All electrical companies or persons having poles in the public streets shall give a bond to the city, in a reasonable amount, to be determined in each case by the board, conditioned for the payment of the cost of renewing dangerous and abandoned poles, and also for the payment of the expense of restoring the sidewalks and pavements where the same have been disturbed or injured in consequence of the erection or removal of any poles owned by them.

The violation of any of the rules and regulations of the board shall operate *ipso facto* as a revocation of the permit held by the company or person guilty of such violation.

The Effect of Electric Shock.

Some impromptu experiments upon the physiological effects of the electric current, or, more properly, difference of potential, have recently been related by Dr. Zacharias, of Berlin. On one occasion when walking along the electric tramway at the mines of Hohenzollern the doctor happened to slip, and in falling caught hold of the conductor, which was at a potential of 300 volts above the rails. This, however, "made little impression upon him." Another time, having incautiously taken hold of the framework of an arc lamp supplied with alternating currents at a potential of 200 volts, he was unable to let go until some one came to the rescue by lifting him off the ground. On this occasion the soil was very damp; in dry weather he found that little or no inconvenience was experienced. The most painful experience which Dr. Zacharias has hitherto encountered occurred in an attempt to disconnect an electro-dynamometer under a potential of 1,500 volts. On this occasion a severe and painful shock was felt through both arms; but still no serious results ensued.

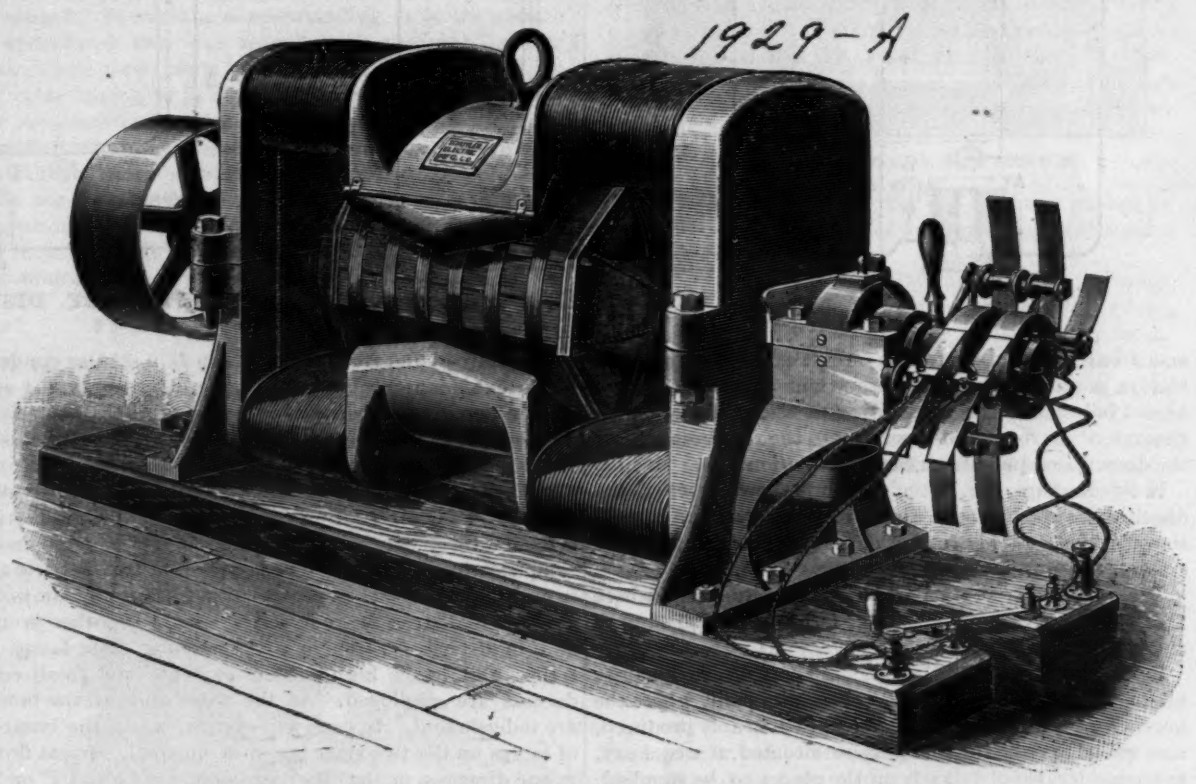


FIG. 2.—NEW SCHUYLER DYNAMO-ELECTRIC MACHINE.

Electric Lighting in Scandinavia.—Electric lighting was recently introduced at the Central Railway Station, Christiana, very successfully, involving a loss to the gas works of $10,000 a year. In Christiana, the gas works are city property, and the corporation is now going in for an electric light plant of its own. The steamers running along the west coast of Norway have been fitted up with Edison installations. In Stockholm the leading theatre is now lighted by electricity, and the city of Gothenberg, Sweden, is to have its streets lit by electricity.

A New Edison System of Distribution.

It has come to be recognized that if high tension currents can be employed for electric lighting and other purposes, with the economy in copper which they permit of, but without bringing the wires carrying the high potentials within buildings where they are subjected to handling, and where contact with them is liable to lead to accident, the scope of electrical distribution would be greatly enlarged. The endeavor to accomplish this object has given rise to a number of systems of late, most of which have been based on the alternating or interrupted current and the converter to reduce the potential from the distributing wire to the house wire.

In order to achieve the same object with the continuous current, Mr. Edison has recently devised a system in which a high tension circuit is employed, and which may in a certain sense be called a multiple-series system on a large scale, with special arrangements for keeping the potentials in each multiple branch constant. In carrying out his idea, Mr. Edison uses a divided source of electricity of high tension consisting of two or more dynamos connected in series placed in a suitable building at a place where power may be produced economically. A circuit extends from this source of power to the various sub-stations, at each of which feeding circuits are taken off, which extend to a district to be supplied with current. All these sub-stations are in series, and from the main circuit conductor between the stations compensation conductors extend, which are connected with the points of division of the source of supply.

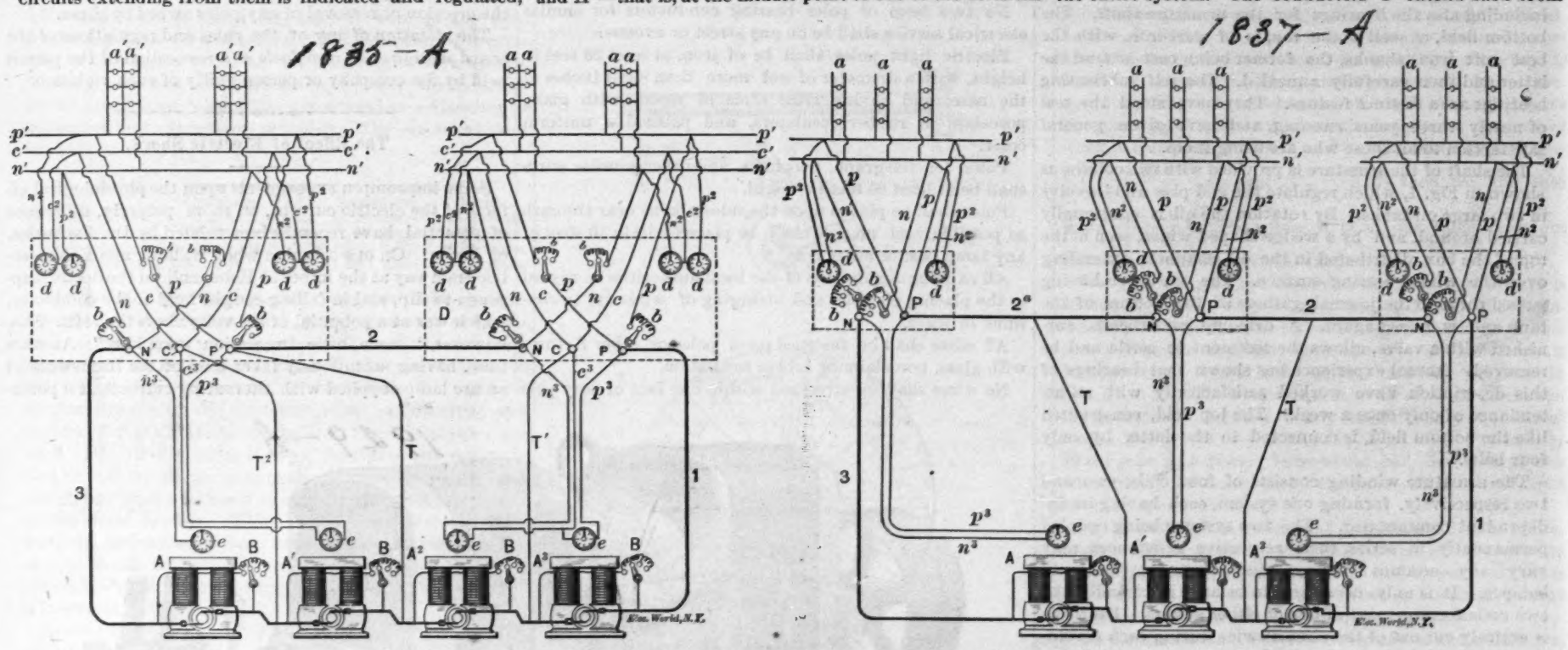
At each sub-station indicators and regulators are provided by means of which the electrical condition of the circuits extending from them is indicated and regulated, lamps $a\ a$ are connected in multiple series on the three-wire system.

Each of the feeding conductors p, n, is provided with an adjustable resistance $b\ b$, by which the two sides of the sub-system are regulated to keep the same constant pressure at all points on the lighting circuits, thus regulating for unequal distribution or changes in the number of lamps in circuit. This regulation is effected in accordance with the showing of indicators $d\ d$, connected across the conductors of three-wire indicating circuits $p^3\ n^3\ c^3$, one of which extends back from the terminals of each feeding-circuit into the sub-station, and which continually show the pressure at the points where the feeders are connected. The sub-station D' is similarly arranged and equipped, the conductor 2 being carried to the terminal point P' and the conductor 3 from the main source to the terminal N', and the feeders extending from terminals P', N' and C', and supplying lamps $a'\ a'$, and provided with indicating and regulating apparatus precisely as explained with reference to the other station. It will be seen that the conductor 2 connects the two districts supplied from the two sub-stations in series with each other and with the generators at the main station. From any point on the conductor 2 between the sub-stations a conductor T extends to the middle point of the series of generators, by which a divided source of electricity is produced, at whose point of division the compensating conductor T is connected. The conductor T is shown as extending from the terminal point P' in sub-station D'. The effect is evidently the same as though it were connected anywhere along the line 2 between the sub-stations.

From the terminal point C in station D a conductor T' extends, which is connected between the generators A^2 and A^3—that is, at the middle point of one of the divisions of the source—and from C' in station D' a similar conductor T^2 extends and is connected between generators A and A', the two divisions of the source being thus themselves divided, or, in other words, the source being thus subdivided into four subdivisions. Thus the two districts form a compensating or three-wire system having a divided source and a compensating conductor, while each district is itself a three-wire system having a divided source and a compensating conductor. The lamps of the two districts are in multiple series with each other—that is, any two lamps $a\ a$ in series in district D are in series with two other lamps $a'\ a'$ in district D'. There are, therefore, four lamps in series, and hence high-tension currents and small conductors are employed. At the same time all the lamps are independent. In each sub-system, when the number of lamps on the two sides becomes unequal, current flows in one direction or the other on conductors c and T' or T^2 to maintain the balance, and if the number of lamps in one sub-system differs from that in the other the balance is similarly preserved by the compensating conductor T.

As stated, the adjustable resistances at the sub-stations are employed to keep a constant pressure at all feeder terminals, thus regulating for unequal distribution or changes in the number of lamps in circuit in different parts of the district. Indicating circuits also extend from the sub-stations to the main station, each of which consists of three conductors, $p^3\ n^3\ c^3$, including indicators $e\ e$, by means of which the condition of each side of each sub-system is continually shown, and in accordance with which the generators are regulated together or separately to regulate the whole current supplied to the entire system, or that supplied to each sub-system or that supplied to each side of each sub-system. It is evident that there may be any desired number of sub-stations and districts supplied, the number of generators at the station being correspondingly increased, so that there will be one or more generators for each side of each sub-system, and conductors being run from between the sub-stations to the points of division, and from the middle terminals of the sub-stations to the points of subdivision of the source. The generators comprising the high-tension source need not necessarily all be placed in the same building or at the same place; but they may be placed at two or more different points, they being, however, always connected in series by conductors extending between the different points.

In the arrangement shown in Fig. 2 each sub-district is arranged as an ordinary two-wire multiple-arc system, although the general system is a compensating one. Three sub-stations, D^3, D^2 and D^1, are shown supplied with high-tension current from a series of three generators, A, A' and A^2. Conductors 2 and 2^a connect the sub-stations in series. At each sub-station the circuit is broken, as before described, at terminal points $P\ N$, and from these terminals the conductors $p\ n$ of any desired number of feeding-circuits extend to lighting circuits $p'\ n'$, with which the incandescent lamps $a\ a$ are connected in multiple arc. The lamps of the three districts are in series with each other through the conductors 2 and 2^a, there being, as shown, three lamps in series, or as many as there are sub-stations. Each feeding circuit $p\ n$ is provided with an adjustable resistance b for regulating the current conducted by it, and indicating circuits $P^3\ N^3$ including indicators d, extend to the sub-stations, as before. Indicating circuits $P^3\ N^3$ extend from the sub-stations to the main station and are connected with indicators e, by whose indications the generators are regulated to affect the entire current supplied to each sub-district or that supplied to the entire system. The conductors T extend back from



FIGS. 1 AND 2.—A NEW EDISON SYSTEM OF DISTRIBUTION.

and from each sub-station a circuit extends to the main station or source of supply, with which circuits are connected indicators, in accordance with whose indication the generators are regulated according to the requirements of the distance supplied from each sub-station.

In the diagram, Fig. 1, the system is shown in which the districts are arranged on the three-wire system, Fig. 2, showing the same with each district arranged as a two-wire system.

The method is particularly applicable to cases where there is a very large area to be lighted or supplied with current from a single source.

Referring first to Fig. 1, A, A^1, A^2 and A^3 are dynamos all connected in series and situated at a point where the necessary power to operate them can be cheaply produced, and which may be for that purpose situated, if necessary, at a considerable distance from the places to be supplied, since the current generated by the series of machines has a high tension, and can, therefore, be economically conveyed by conductors of small mass. Each generator can be regulated separately by means of the adjustable resistances $B\ B$, placed in the shunt field circuit of each machine.

From the terminals of the series of machines a circuit 1, 2, 3, is extended to D and D^1, which represent sub-stations to which the circuit extends. The dotted rectangles indicate rooms or places into which the conductors are run, and in which the connections are made and the indicators and regulators are placed. In the station D the conductor 1 is brought to a positive terminal point P, and from a negative terminal point N the conductor 2 extends to the next sub-station; and there is also a third terminal point C. From the sub-station extend two feeding circuits p, n, c. The conductors p extend from terminal N, and conductors c from terminal C, and these conductors are all connected, respectively, with the positive, negative and compensating circuit-conductors $p'\ n'\ c'$, with which the

The Amyl-Acetate Standard Lamp.

To the Editor of The Electrical World:

SIR: Will you kindly inform me, through the columns of your paper, in regard to the candle power of the Siemens and Alteneck standard lamp, arranged to burn amyl-acetate with a flame of fixed height. I had considered it as one candle. Upon comparison with a sperm candle, corrected for rate of burning, etc., it appears less. W. E. S.

HARTFORD, Conn.

ANSWER.—This lamp is designed to be equal to one English or spermaceti standard candle at 44 m. m. (1.73 inches, nearly 1¾) height of flame. The inventors, however, claim that the English candle, as well as the other standard candles, are so unreliable that no exact equivalent can be given. They have made numerous tests with their lamp, and find that it is quite reliable. You will find a detailed description of this lamp in an article by the inventors in the *Elektrotechnische Zeitschrift*, Jan., 1884, p. 20. In this article they do not appear to have made the test by weighing the English candle, which should burn 120 grains per hour; perhaps the discrepancy which you find is due to this fact.—EDS. E. W.

An Electrical Distributor.*

It is curious to note the rapidity with which an idea that has once entered into the domain of applied science is developed and improved upon. Some years ago we drew attention to the ingenious automatic contrivances to be seen in London and Paris at the time of the exhibitions. By putting a penny into the slit, a little scene was acted, and the figures in it set in motion to the great delight of juvenile visitors. After these came the automatic weighing machine, showing your weight when you step upon the little platform with which the instrument is furnished and slip a nickel into the slit. From these it was but a step to the distributors, *i. e.*, apparatus which deliver some object, a box of matches, post-card, etc., on receipt of the coin representing its value, and these have now appeared under many forms more or less clever and ingenious. It is evident that these distributors, which are really automatic vendors, are likely to become of great service in large towns, and may be adapted to innumerable purposes.

We will now describe a new distributor of this kind which is frequently to be met with in the streets of Paris: this apparatus, invented by M. Brunet, is employed for distributing the *Petit Journal* on payment of a penny, but it is chiefly used for the distribution of small boxes of sweetmeats on payment of two cents. This apparatus contains improvements on the preceding ones, and we think a description of it will be interesting.

The apparatus in question may be applied to the sale of any object, the weight and volume of which are constant, at the prices of 5, 10 and 50 centimes, 1 franc, 5 francs, 10

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FIG. 1.—AN ELECTRICAL DISTRIBUTOR.

francs, 20 francs, etc. While the other distributors work by means of a more or less ingenious and improved mechanism, M. Brunet's is worked by electrical machinery set in motion by the introduction of the coin.

One point which it is very important to note, is that this distributor is the first (and up to the present the only one) that is entirely self-acting; directly the required sum has been dropped into it, the commodity sold is pushed out, whereas in all other distributors now in existence, the purchaser, after having put in his penny, is obliged to act himself, having either to open a drawer containing the object required, or to work a lever, or to do something of the kind; in other words, he has to supply a force which is indispensable to the working and which the apparatus is incapable of producing alone.

Fig. 1 shows the outward appearance of the distributor. A boy is represented putting a penny into the slit; the packet of sweetmeats falls into a little trough at the left below the letter *P* in the word *pastilles*. Fig. 2 represents the distributor open so as to show the mechanism. The diagram, Fig. 3, explains clearly the working of the apparatus.

The electro-automatic distributor consists of a distributing wheel *A*, the circumference of which is divided into compartments equal in size, in which are placed the articles to be sold, which are constant in weight and bulk. They are distributed one by one at *X*, as the wheel performs its revolution.

On the other side is the flat tube *T*, in which the coin is placed (a penny, for instance). At the middle of the tube are two points of contact *M* and *N*, separated by a space equal to the diameter of a penny.

At the bottom of the apparatus is a battery, the current from which, passing through the electro-magnet *E*, is only interrupted between *M* and *N*. If a penny is placed in the tube it falls as far as the two points *M* and *N*, where it is held. It thus closes the circuit of the current which passes through the coin itself, and works the electro-magnet *E*, placed above the distributing wheel. The armature being attracted to *F* is balanced at *G*, and thus raises at its extension the little hammer *H*, which was caught

*La Nature.

in one of the teeth of a circular rack placed at the back of the wheel *A* and keeping it still. The wheel, therefore, being released, and impelled by the weight of the packets to be distributed, begins to turn and slips out at *X* a packet which falls upon an inclined plane and passes out.

It will be observed that the point of contact *M* is movable and forms part of a bell-crank lever pivoted at *L*, its other arm being terminated by a rod *K* placed in front of the divisions of the distributing wheel. On the latter be-

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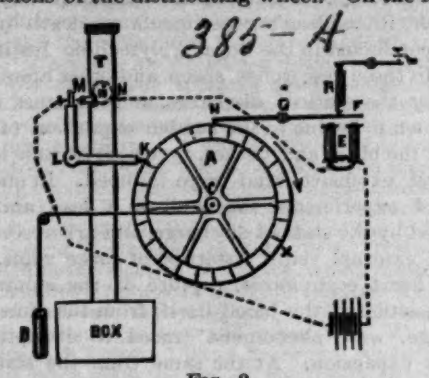

FIG. 3.

ginning to turn, one of its divisions raises the rod *K*, the lever turns at *L*, and the contact *M* becoming further removed from *N* the coin drops into the box. The current being thus interrupted, the armature of the electro-magnet is brought back to its original position by a spring *R*; the hammer *H* holds the wheel again by catching in the next compartment. The apparatus is thus brought to rest and ready to deliver another packet as soon as another penny is introduced.

Moreover, above the wheel is a series of tubes filled with packets, which by their weight refill the empty compartments beneath them. A weight *B*, the cord of which passes around the pulley *C* has the effect of increasing the force of rotation. A little door closes the slit for the money as soon as the last packet is delivered. Lastly, an electric bell placed in the circuit announces the reception into the box of each coin.

Names for Electric Units of Self-Induction and Conductivity.

Writing to *Nature* Prof. Oliver J. Lodge says: "A name seems to be wanted for the practical unit of self-induction, viz., an ohm multiplied by a second, in other words, for a length approximately equal to an earth-quadrant. Professors Ayrton and Perry call it a 'secohm.' Why not call it a 'quad?' It would be a handy great length for many other purposes. For instance, the velocity of light in air would be 30 quads per second, in common glass 20 quads per second. To avoid misunderstanding, it would have to be understood that the actual earth-quadrant passing through any given place is only approximately a quad, its real value having to be determined geodetically. A quad is to be understood as ten million metres *precisely*. Another unit requiring a name is the unit of conductivity. Sir William Thomson has suggested the word 'mho,' but it has not been greedily assimilated. I make the small suggestion of omitting the *h*. True, the expressions 12mo and 16mo would at first excite only bookbinding ideas, but they would soon carry a fresh meaning to electricians."

Electric Fans for Hot Weather.

The prevalent hot weather has done much to call attention to the importance of proper methods and devices for securing coolness and ventilation. One great trouble

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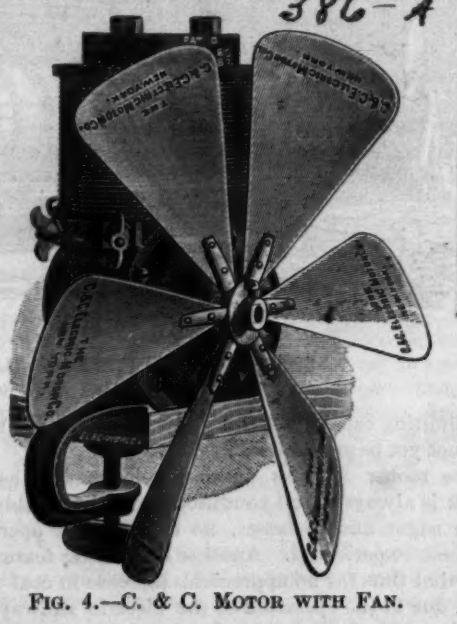

FIG. 4.—C. & C. MOTOR WITH FAN.

hitherto has been experienced in securing power to operate fans, but it is now being very generally realized that the small electric motor affords a very happy solution of the case. One of the motors that has come into active demand for this class of work is that made by the C. & C. Electric Motor Company, who have also manufactured a brass fan specially for this purpose. The small cut herewith shows the motor with fan attachment. The combination is an exceedingly neat and effective one.

Small Mirrors for Electrical Apparatus.

BY DR. JAMES B. WILLIAMS.

Experimenters and amateurs in electricity frequently take pride in making their own instruments, and their work sometimes brings them to instruments whose readings are given by reflection of a mirror, as in the mirror galvanometer. The making of these little mirrors is a tedious operation to many, but a method practiced by myself, and which has given very good results, is the following:

Take five or six thin glass circles, such as are used in mounting microscopic objects, and clean them thoroughly by rubbing them with a small piece of cotton tied to a stick, which has been dipped in nitric acid. Then wash them in a solution of caustic potash, or strong ammonia water, and finally rinse them first in clean and then in distilled water. Dry them thoroughly with a piece of soft linen rag, and fasten them on a piece of cardboard with mucilage, by placing small drops of mucilage near the edge of a card and allowing the circles to fall upon them. Next, take a piece of good looking glass and cut out circles of the alloy upon the back of it near the edge, by laying a coin a little larger than the glass circles upon the alloy, and draw a sharp pointed instrument around the edge of the coin. Remove all of the alloy between the circles and the edge of the looking glass so that the circles of alloy can be slid over the surface of the looking glass and on to the thin glass circles gummed on the card. The circles of alloy are loosened from the looking glass by placing a globule of mercury upon them and spreading it over them

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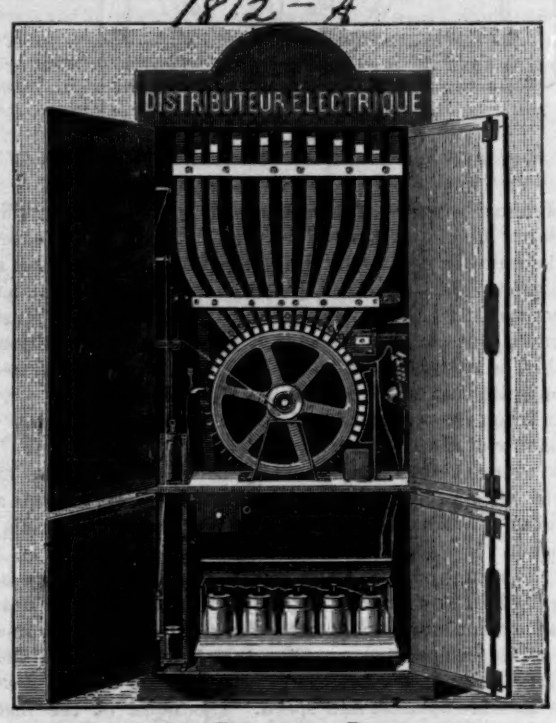


FIG. 2.—AN ELECTRICAL DISTRIBUTOR.

with the finger; after which they can be gently pushed on to the glass circles, the edge of the card being held against the edge of the looking glass.

After placing the circles of alloy upon the thin glasses, press them gently with the fingers upon all portions. Next cut discs from a piece of heavy tinfoil, a little larger than the circles of alloy, lay them gently upon the latter, and press them firmly upon the alloy. By so doing all of the superfluous mercury is removed from the alloy and unites with the tinfoil. The outer alloy formed by the union of the mercury and tinfoil is then removed by scraping it gently with the edge of a sharp knife blade. A coating of shellac dissolved in alcohol is then painted over the backs of the mirrors, and after it has become dry the mirrors are removed from the card by moistening the latter with water.

I have used mirrors made according to the above-described process in my galvanometers and electrometer, and find they will, when used with a biconvex lens, give an excellent definition of a cross hair 3 and 4 feet away from the mirror.

The beginner had better practice upon thick glass circles, for he will be most certain to break thin ones while pressing the alloy upon the glasses.

The mirrors will be found to answer all purposes except in the cases where an extremely light mirror (as in a Thomson astatic galvanometer of high resistance) is required, when the silvering process should be used. If the process be successfully performed, the mirrors can be broken before the alloy will leave the glass.

The Three Wire System.

To the Editor of The Electrical World:

SIR: I noticed in an article recently in a scientific journal a reference to what is known as the three wire system used in incandescent lighting. Where will I find a description of it, or has it been given through your columns or will it be? W. H.

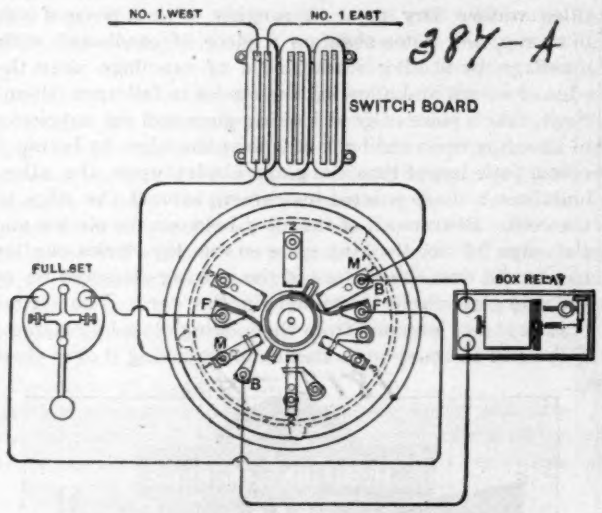
NEVADA, IOWA.

ANSWER.—We have at various times published articles on this system. You will find a complete description of this system in Edison's U. S. Patent, No. 274,290 of March 20, 1883.—EDS. E. W.

The Waters-Sweeny Telegraph Switch.

In telegraph offices having a number of wires and attended only by a single operator, such as is frequently the case in railway telegraph work, each line is equipped with its own relay, key, sounder and local battery. The attendance required by all these makes the work of a single operator very onerous, as the apparatus is usually distributed on a number of tables; and besides the expense is considerable. To avoid this difficulty an arrangement has recently been devised by the Waters-Sweeney Telegraph and Telephone Switch Company of Terre Haute, Ind., exhibited at the meeting of the Railway Telegraph Superintendents, in Boston, last week.

The switch consists of a little box about 1¼ inches high and 7 inches in diameter. Its arrangement is given in



THE WATERS-SWEENY TELEGRAPH SWITCH.

plan in the centre of the accompanying illustration, which shows it connected up in a three-wire office. Whatever the number of wires entering the office, only one full set, consisting of key, relay and sounder, is required, which are connected to the points *F* and *F'* from which brushes make contact with the switch segments. In addition to this, on each line is a box relay which is connected to the opposite post on the switch, *B*, *B'*, in this case.

When the operator is called on any line he turns the handle of the switch to the point marked for the line. By so doing the box relay on which he was called is at once cut off and his "full set" put in its place without any break whatever in the main line, and he then proceeds as usual.

By means of this system only a single local battery is required for any number of lines, and that battery is not in use except when the operator himself is using some line.

A single operator can thus take care of half a dozen lines without leaving his chair, and can therefore work with more comfort and speed. The noise of the instruments is also reduced, for the box relays give quite sufficient sound for any case. When using any line the operator, by means of the new switch, puts his relay and sounder on the line in use, thus making the sound on that line louder than the others, so that he is not obliged to stop one or two instruments before he can take his messages.

The Novelty and Electric Company has been formed at Memphis, Tenn., by Messrs. J. D. Randall and B. F. Tatem, as manufacturers' agents and dealers in electric goods and novelties. The company has now been doing business for two or three months with good results, and has bright prospects.

Electric Lighting in Switzerland.—It is stated that the use of water-power in Switzerland for electric lighting purposes is greatly on the increase. One of the latest installations of the kind is that of Engelberg, where a Schuckert machine capable of running 500 lights is now supplying 300 Siemens 101 and 102 volt incandescent lamps, and 5 arc lamps of 1,000 candle-power each are also in use.

Rochester, N. Y.—The Brush Electric Light Company, G A. Redman superintendent, has 81 electric motors in use on its arc circuits. The motors range from $\frac{1}{10}$ h. p. up to 12 h. p., and are of Brush, Cleveland and C. & C. make. They are used to operate elevators, printing presses, machine shops, tailors' shops, coffee mills, ventilators and incandescent machines. The generating dynamos are operated by water-power. The motors are in good demand, and give general satisfaction.

Buffalo, N. Y.—The Brush Electric Light Company of Buffalo, N. Y., has recently put in a large number of electric motors, including two 1 h. p., six 2 h. p., six 4 h. p., one 6 h. p. and one of 8 h. p. from the Brush Company; also ten ½ h. p., fifteen ¼ h. p. and fifteen 1 h. p. from the C. & C. Company. These motors are all on arc circuits, and are used to run printing presses, coffee mills, sewing machines, ice cream freezers, laundry machines, etc. The motor business is booming in Buffalo.

Toronto, Ont.—The Toronto Electric Light Company, as mentioned last week, has lately supplied a 60 h. p. generator and a 40 h. p. motor for the Industrial Exhibition Association of Toronto. This motor propels three cars and its own motor car, carrying 350 passengers per trip, at a speed of 30 miles per hour. It will be in regular operation from the first to the seventeenth of September next. The company has several small motors of its own make running on its arc circuits, for coffee mills, etc., and is now putting up a special motor circuit. In its new central station it is making special provision for power distribution, and proposes to use constant current for small motors; for larger powers it is likely to use potential current.

The Causes of Death by Electricity.

The London *Lancet*, a leading medical journal, remarks that the observation of M. D'Arsonval, quoted by us recently, that dynamic discharges and alternating currents do not (like static discharges) produce serious organic disruption of the lining tissues, is not a new discovery. The special disruptive and fatal effect of the statical discharge has long been known, and was most fully brought out in Dr. Richardson's experiments on death by electric shock, conducted in the Royal Polytechnic Institution in 1869. In those researches sheep and other animals were killed by the statical discharge, and the cause of death was shown to be due to the sudden expansion of gaseous parts of the blood and tissues, by which organic lesions of the most extensive kind were induced. In one of this series of experiments the skull of a dead animal was fractured by the statical discharge, and arborescent markings of external veins, distortion of large veins, rupture of the heart, ecchymosis, rupture of the stomach, and decomposition of the blood itself, from the same kind of discharge, were phenomena traced to disruption from gaseous expansion. At the same time the statical discharge does not always kill. It may simply stun, or cause a temporary anæstheeia, or produce a state resembling catalepsy, followed by recovery.

The Electric Railway in the East Boston Sugar Refinery Works.

The ease and slight expense at which an electric railway can be operated in large works already provided with a dynamo for electric lighting is well shown in the venture recently carried out by the East Boston Sugar Refinery at East Boston. This refinery, which is the largest in New England, is situated about 1,300 feet from the docks where the raw sugar is unloaded from the ships. Formerly the hogsheads and bags were loaded on a railroad truck drawn by horses, the work being such as to tax the animals very severely and necessitating frequent changes.

As the refinery is provided with a 150-light Edison plant, it was determined to put in an electric railway, and the installation was undertaken by the Sprague Electric Railway and Motor Company, of this city.

The rolling stock consists of two flat cars, one of which carries the motor of 15 h. p at its forward end, together with a raised platform, upon which are placed the regulating and reversing switches.

Our illustration shows the cars, which are capable of taking a load of 12 hogsheads, equivalent to 30,000 pounds. The current is taken from the lighting dynamo and led to the motor from an overhead wire and trolley, the track being used on the return.

With the electric railway the work of transfering can be done in one-fourth the time formerly required with horses; and although ships are constantly unloading at the docks

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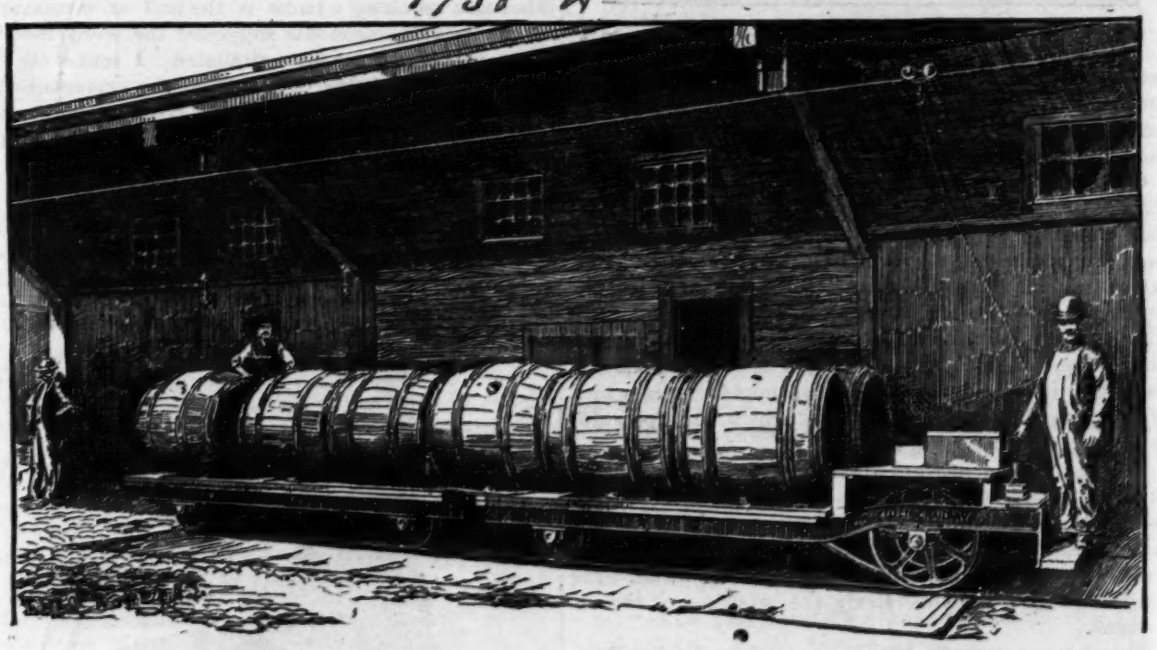


SPRAGUE ELECTRIC RAILWAY, SUGAR REFINERY, BOSTON.

the limiting capacity of the railway to handle the work has not yet been reached.

The motor operates without noise and although the track is always in bad condition, being invariably covered with sugar and molasses, no difficulty in operation has yet been experienced. Another interesting feature is the fact that thus far no appreciable increase in coal consumption, due to the operation of the electric railway in connection with the lights has been noticed.

Electric Gongs for the Cable Roads.—The newest thing on the cars of the 125th street cable railroad is an electric gong. Heretofore the warning bell for crossings and other places where people have been in the way has been rung by a string that dangled in front of the grip man. It kept one of his hands busy most of the time pulling the string. By the new arrangement he has only to press his foot on a button in the platform and the bell clangs rapidly until he lifts his foot.

Partial Resistance of Telegraph Lines.

To the Editor of The Electrical World:

SIR: I would like to submit a problem upon which I seek enlightenment. Probably some of your readers can favor me, through the columns of THE ELECTRICAL WORLD, with the correct solution, and how it was arrived at.

I desire to know what is the insulation resistance of a *portion* of a main line, the entire length of which is 180 miles. The insulation resistance for the entire length is known to be 283,734 ohms, and the insulation resistance of 150 miles of this same line is 406,824 ohms. What will be the insulation resistance of the remaining 30 miles?

MONTREAL, P. Q. J.

On the Supposed "New Force."

At one of the May meetings of the Royal Society Mr. Crookes discussed the supposed "New Force" of M. J. Thore, whose experiments led him to believe in the existence of a new force inherent in the human organism. M. Thore suspends a small cylinder of ivory by a fibre of cocoon silk forming a small pendulum which hangs freely over the centre of a table. The cylinder having become motionless, M. Thore brings a second cylinder, called the "pillar," about a millimetre from the first cylinder, when the latter begins to rotate clockwise if the pillar is on the left, and counter clockwise if the pillar is on the right of the cylinder. The observer is supposed to face the cylinder and pillar. M. Thore says that the rotation is independent of the nature of the cylinders, of their mass, or the dimensions of the pillar; light, heat, electricity, magnetism, gravity and air currents, he says, are also inadequate to explain the phenomena.

Mr. Crookes repeated M. Thore's experiments, and came to the conclusion that the action is one of radiation from the face or other warm body in front of the apparatus, and that there is nothing special in the human organism beyond the heat it radiates to produce rotation of the cylinder.

Mr. Crooke's experimental results were sent to M. Thore, who replied that the dynamical explanation was not sufficient to account for more than a few of the facts he describes, and saying that he "persists in still believing that this force emanates from the observer, or else that the observer is the indispensable intermediary for its manifestation." In reply to this Mr. Crookes states that although he experimented in an enclosed space, while M. Thore experimented in free air, and thinks that enclosure may almost or quite suppress force, he has verified nearly all M. Thore's facts of rotation by his method. He had verified the facts of rotation when working in the free air of a large room, and it was only when he found the delicacy of the observations was impeded by draughts and currents that screens were put round the apparatus.

A Dr. Shettle maintains in the London *Electrician*, as quoted by us some weeks ago, that the results obtained are directly due to electric or magnetic influence, and not to heat radiations.

The Electric Light Afloat.—New and special uses for the electric light on board men-of-war are being found. A recent plan is to place an arc light at each end of the ship, and converge their beams on the distant object. The angles made by the beams with the base line are observed, and a simple trigonometrical formula gives the distance of the object. To facilitate the operation, the ship can be brought round till the angles are equal, or approximately, and a table can be used to give the result. In the French Navy strings of incandescent lamps on the yard-arms have been used of late to convey messages by means of flashing in accordance with the Morse and other codes. It is easy to read the flashes at a considerable distance. The extent to which electric lights are now used for naval purposes is shown in the fact that the English Admiralty has recently contracted for no fewer than 38 sets of dynamos and engines.

Meeting of the Association of Railway Telegraph Superintendents.

The sixth annual meeting was held at Boston, Mass., on July 13 and 14, last. At eleven o'clock Wednesday, July 13, the following named old and new members of the association met in one of the spacious parlors of the historic and hospitable Tremont House, viz: A. R. Swift, C., R. I. & P. R. R.; G. L. Lang, N. Y. & N. E. R. R.; P. W. Drew, C. & E. I. R. R; W. K. Morley, C. & A. R. R.; J. B. Shaw, N. Y., P. & O. R. R.; C. B. Davison, C., St. P., M. & O. R. R.; L. A. Boyd, L., D. & S. R. R.; M. Magiff, Central Vt. R. R.; E. E. Torrey, Michigan Central R. R.; S. S. Bogart, N. Y., W. S. & B. R. R.; L. F. Sheldon, Mo. Pacific R. R.; G. C. Kinsman, Wabash R. R.; G. T. Williams, N. Y., C. & St. L. R. R.; G. H. Hill, So. Kansas R. R.; C. C. Reynolds, I. & St. L. R. R.; S. K. Blair, N. Y., C. & St. L. R. R., C. E. Hilton, Norwich & W. R. R.; J. N. Ross, N. Y. & N. E. R. R.; J. W. Lattig, L. V. R. R.; N. E. Smith, N. Y., N. H. & H. R. R.; T. J. Higgins, C., C., C. & I. R. R.; G. E. Simpson, C., M. & St. P. R. R.; C. Selden, B. & O. R. R.; M. B. Leonard, N. N. & M. V. R. R.; I. Cohen, H. & Texas Cen. R. R.; C. A. Darlton, R. & D. R. R.; W. J. Holmes, N. Y., L. E. & W. R. R.; C. E. Topping, Long Island R. R.; H. C. Robinson, B. & Lowell R. R.; C. M. Chevalier, N. Y. & N. E. R. R.

The officers of the association for the year ending with this meeting were:

President, A. R. Swift.
Vice-President, G. L. Lang.
Secretary and Treasurer, P. W. Drew.

The president called the meeting to order and the report of the treasurer was received and accepted.

The chief discussion of Wednesday's session was upon the subject of superfluous and improper messages sent over the railway telegraph wires and the best method for detecting them and enabling the superintendents to obtain tolls on same. It was suggested that a committee be appointed to ascertain if an instrument could be devised and manufactured for the purpose of detecting and recording all messages passing over the wires and to be termed an automatic recording register. After the unanimous vote of those present in favor of this suggestion, it was decided upon that the committee referred to should visit the great commercial telegraph offices in New York, and there inspect the various kinds of apparatus in use. President Swift appointed the following named gentlemen to constitute the committee for the purpose named: Messrs. S. S. Bogart, W. J. Holmes, C. E. Topping, C. Selden and M. Magiff. It was then agreed upon that this committee be authorized to extend an invitation to manufacturers of recording instruments to submit plans for a recording register which would meet the requirements of the members of the association.

Before the close of the session the following new members were admitted to the association: F. H. Benjamin, N.& W. R. R.; W. J. Holmes, N. Y. & L. E. R. R.; W. H. C. Robinson, B. & Lowell R. R.; J. B. Frost, N. Y., N. H. & H. R. R.; C. A. Darlton, R. & D. R. R.; H. N. Rowell, B. & Maine R. R.; E. A. Smith, Fitchburg R. R.; S. K. Blair, N. Y., C. & St. L. R. R.; J. B. King, W., St. L., P. R. R.; D. K. Smith, K. C. & B. R. R.; J. W. Lattig, L. V. R. R.; E. M. Herr, C., B. & Q. R. R.; J. V. Goode, W. W. R R.; R. B. Woolsey, Vandalia R. R.; C. S. Miller, J. C. R. R.; I. N. Ross, N. Y. & N. E. R. R.; C. E. Hilton, N. & W. R. R.; N. E. Smith, N. Y., N. H. & H. R. R.; C. N. Chevalier, N. Y. & N. E R. R.; J. D. Gibbs, Mo. Pacific R. R.; L. B. Foley, D., L. & W. R. R.; W. W. Montalo, N. Y., W. S. & B. R. R.

Among a few others present, not members of the association, were representatives of the electrical journals and Mr. G. L. Wiley of the Standard Underground Cable Company.

After a number of short discussions on matters of minor importance, the first session was adjourned to meet again on Thursday morning at 9.30 oclock, and at the same place.

Immediately after adjournment the members of the association repaired to a hall adjoining the meeting room, where several electrical and mechanical devices used in railway work were on exhibition. The exhibit was a very interesting and valuable adjunct to the regular meeting, and the members of the association evinced their appreciation of the efforts of the exhibitors by carefully looking into the details and working of all the apparatus displayed. The following is a brief summary of a few of the exhibits: The Waters-Sweeny telegraph and telephone switch attracted special attention on account of its new and novel features. [An illustrated article regarding this useful device will be found in another column of this week's ELECTRICAL WORLD.]

The magneto-electric signal exhibited by its manufacturers, the Pennsylvania Steel Company of Steelton, Pa., also found favor with those who saw its systematic, reliable and rapid operation. It has been adopted by the Chicago, Hamilton & Dayton Railroad, and at an early day it will be in use on the following railroads, whose respective managements have carefully examined its workings and passed favorably upon it, viz.: the Grand Rapids & Illinois, in Michigan; the "Nickel Plate" and the New York, Lake Erie & Western. This system has been illustrated and fully explained in THE ELECTRICAL WORLD.

The Messrs. Blodgett Brothers & Company, of Boston, received high encomiums from the visitors for the handsome exhibit of their electric clock, used for starting railway trains. It has been in successful operation for some time past at the Boston depots of the following named roads: Boston & Albany, Boston & Providence, Boston & Lowell, Boston & Maine and Fitchburg.

Mr. A. L. Russell, of Boston, manufacturer of telegraph and electrical instruments of all kinds, had a very handsome exhibit of his varied products inclosed in a large and elaborately mounted rosewood case. So much interested were several of the association in this exhibit that a party was made up and started off on a visit to Mr. Russell's factory at 109 Court street, for the purpose of seeing more of that gentleman's handiwork.

The attractive display made by the American Automatic Fire Alarm Company, of Boston, merited the praise bestowed upon it. It showed the working of that company's local system of automatic fire alarm, illustrated by an annunciator bell and testing device.

After the members had thoroughly inspected all the exhibits they filed into the dining room, some accompanied by their wives, where a sumptuous repast awaited them.

Later in the afternoon the majority of the members in attendance, with their ladies, embarked on the steamers Twilight and Rose Standish for a sail down the harbor and a visit to Nantasket beach. Although very hot in the city, a refreshing breeze was blowing across the water, but the surface of the bay was as placid as an inland lake.

At the beach there was one of the largest crowds seen this season, but none more gay and full of spirits than the telegraph superintendents.

At 9:30 o'clock sharp on Thursday morning, July 14, President Swift was in his chair and called to order the second session of the sixth annual meeting.

Mr. G. L. Lang, chairman of the committee on the alphabet, reported on the advisibility of substituting something in place of the long dash to represent the cipher. While the desirability of some substitute was acknowledged, no agreement could be reached as to what to substitute, and the committee, therefore, made no recommendation. There was an interesting discussion on the report, and, while all of the speakers acknowledged that some change ought to be made, inasmuch as the same symbol is used to represent the letter L and the cipher, no one suggested any substitute. It was finally voted to instruct the committee to decide for the association upon some symbol. Mr. Lang declined to serve longer, and the committee was constituted as follows: Messrs. Selden, Holmes and Topping. It was voted to hold the next meeting in New York on the second Wednesday in July, 1888. The association proceeded to the election of officers, which resulted as follows: President, George L. Lang, of the New York & New England Railroad; vice-president, G. C. Kinsman, of the Wabash system; secretary and treasurer, P. W. Drew, of the Chicago & Eastern Illinois Railway. A general discussion took place upon the use of electricity in connection with track signals, lighting of cars, etc., and various gentlemen told about their acquaintance with the subject on their own lines of railroad.

The subject of the Telegraphers Union was introduced by President Swift, and the entire ritual and constitution of the order were read by him. The oath administered to the initiates was especially called to the attention of the members of the association. The part of the oath which pledges every member not to teach telegraphy to any person without the consent of the chief telegrapher was strongly denounced, and there was a general declaration of an intention to take prompt measures to prevent operators from joining the union.

After adopting a vote of thanks to the Old Colony, Boston & Maine and New York & New England railroads for courtesies extended, and to Mr. G. L. Lang for his efforts in making the meeting so pleasant, the meeting adjourned to July 14, 1888.

The Boston *Herald* in referring editorially to the association had this to say: The telegraph does not play quite so important a part in the operation of railroads in New England as in other parts of the country. This is largely due to the fact that most of the prominent lines in New England are double tracked, while in the West and South single track roads are the rule, and of necessity the telegraph has to be extensively employed in directing the movement of trains. The Association of Railway Telegraph Superintendents has been organized "for the interchange of ideas in the management, maintenance, improvement, etc., of railway telegraph lines, and in securing to railways telegraph employés of the highest standard." Superintendents of telegraph or chief dispatchers in charge of telegraph departments are eligible to membership.

NEW YORK NOTES.

OFFICE OF THE ELECTRICAL WORLD,
NEW YORK, July 18, 1887.

The American Electric Manufacturing Company has for some time past been adding some very able representatives to its staff. One of the latest acquisitions of the company is Mr. A. B. Griggs, formerly associated with Manning, Maxwell & Moore. Mr. Griggs has already given a sample of his ability by securing a big contract in Brooklyn against somewhat serious odds. He will add 70 American lights with dynamos and New York Safety Steam Power Company's engine to the plant in the large dry goods building of A. D. Matthews & Sons. This is not only a good start for Mr. Griggs, but an excellent send-off for the company in Brooklyn.

The New York Safety Steam Power Company continues very busy supplying the demands for its engines in all the various industrial departments, especially in that of electric lighting. One of the recent orders is for Lincoln, Neb., which takes a 300 h. p. plant from the company, consisting of 3 engines 13×12 and 4 boilers, with all necessary appurtenances. Another plant is one of 100 h. p. complete for the fine Edison plant in the New Orleans Custom House. It comprises 2 engines and 4 boilers, and is considered to be the finest plant of its kind in the Crescent City.

Charles Schieren & Co., of Cliff and Ferry Streets, were never more active than at present, furnishing their oak tanned "electric" belts for electric light plants, which can now be found in Brush, American, Edison, Westinghouse, United States, Thomson-Houston, Excelsior and other plants all over the country.

The Empire City Electric Company, of 779 Broadway, a most enterprising and pushing concern, has now taken the building 15 Dey street, and will carry on both establishments. Dey street, as everybody knows, is specially devoted to electrical concerns, and the company has shown good judgment in securing quarters there. The main floor, off the street, will contain various electrical supplies, and the three upper floors will be devoted to manufacturing purposes, turning out dynamo gas lighters, window tappers, learners' telegraph instruments, bells, batteries, annunciators, burglar alarms and other things of similar nature. The building has also a fine cellar and dry sub-cellar in which to carry a large stock, etc. The company will devote itself in Dey street to the wholesale and retail trade, carrying a full line of electric light, telephone and telegraph supplies, and will fit up with storage batteries from the Electrical Accumulator Company, lighting the whole building. The up-town store will be devoted to the retail trade. The new quarters will be occupied about the 1st of August.

J. N. Pratt, manager of the Jarvis Engineering Company's branch office, No. 109 Liberty street, New York City, reports his business as good. He has recently received orders to set two boilers with the Jarvis boiler setting for the Thomson-Houston Electric Light Company, Jamestown; one boiler for the Root Manufacturing Company, Cohoes; one boiler for the Parsons Manufacturing Company, Cohoes; two tubular boilers and one Heine sectional boiler for the Carteret Chemical Company, Newark, N. J.

E. A. Wildt & Co., 83 Murray street, manufacturing electricians for the trade, have lately put on the market an improved gravity drop annunciator and burglar alarm, which is meeting with a heavy demand.

The Union Fire Alarm Company, 145 Broadway, are now occupying new and handsome quarters on the third floor of that building, where they are glad to exhibit at any time their valuable improvements in fire-alarm apparatus. They have added many features of novelty to the system, which has been appreciated and adopted by numerous city departments throughout the United States.

A committee of the Boston Board of Aldermen visited this city and Brooklyn last week to make investigations on the subject of underground work. The party was accompanied by President Gilbert of the Boston Electric Light Company. The committee learned all it could as to the working of the subway commissions on both sides of the East River, and also paid its respects to Mr. E. H. Johnson, the president of the Edison Company, who gave it particulars as to the extensive underground work done and contemplated with the Edison system. After leaving New York the committe went on to Philadelphia, where Mr. D. Walker showed it what had been accomplished there under the auspices of the city electrical department, of which he is chief. A part of the committee has also, I hear, visited Washington, and may go even further afield before it considers its work finished. Boston ought to have a good underground system after this trip of its city fathers.

The argument on an order to show cause why an injunction should not be granted restraining the Board of Electrical Control and others from laying conduits was heard this Monday afternoon by Justice O'Gorman. The allegations of the plaintiff are that the act of 1887, relating to subways, is unconstitutional; also that the time in which the Governor should sign the bill, to make it a law, had expired.

The New York *Times* has the following interesting item: "Jay Gould's son Edward stood openly all day in the Consolidated Stock and Petroleum Exchange, selling his papa's specialties by wholesale. The young man—just past his 21st birthday—was credited with having sold over 10,000 shares of Western Union alone. This same lad pursued these same tactics just before the last shakeup came to Wall street. It has been estimated that he cleared $50,000 then."

The heavy storm of Sunday did serious damage to the wires in and around this city. Two lines of the Baltimore & Ohio Telegraph Company were broken between here and Boston, and two more in the north and west running from this city to Albany and Rochester and Buffalo and Chicago. In the southwest five wires were destroyed. These extended to Philadelphia, Washington and Baltimore. All the wires were repaired by two o'clock. Only five wires were blown down in this city. The Western Union Company had a number of posts blown down on the Jersey meadows, and also between Baltimore and Washington. By two o'clock everything was running smoothly. The United Lines Company's loss was very great. Twenty-five lines were broken between New York and Philadelphia, and six between Harrisburg and Pittsburg. Six wires were destroyed on the Postal line between New York and Olean, N. Y., and twenty-five more were blown down in New York city. All damage was repaired by noon, however. The Metropolitan Telephone had several hundred of its lines crossed by the gales, but no wires were broken, and no serious damage was done. Everything was put in shape within 24 hours.

Hazazer & Stanley, 32 Frankfort street, have built up a good business as manufacturing electricians, and have lately increased their force of workmen to meet the demand for their specialties, a number of which you have noticed recently.

In some of the offices I have visited recently I have found in use Edwards & Co.'s electric door opener. The opener is affixed to the gate like an ordinary catch, and the concealed wires are carried to a desk nearby, where sits a quiet young man, whose observant eye is ever on the door. As officials, customers and those who have the entree approach, the gate swings invitingly open, but the stranger, finger the gate as he may, finds that he cannot get in, and he has to wait until his business is fully declared. This is but one way to use the opener, for which an endless variety of applications suggest themselves.

Last week I noted the incorporation of "The E. S. Greeley & Company," and referred to the pleasing nature of the circumstances under which the new corporation has been formed. Aside from the general talk and comment that this important change has caused in electrical circles, there has been quite a brisk discussion over the correctness of the style grammatically. Some people say that the name is all right without the "&," and that the "&" is superfluous. On the other side it is held, and correctly, I believe, that all that was required by law was the addition of "The" to the old style, as shown. Such is said to be the legal view of the point. Mr. M. Goodyear remarked to me this week, in his wontedly dry and humorous way, that the company had had a good deal of superfine criticism proffered it on the subject by newspaper men and printers, some of whom had been quite anxious as to whether they should "follow copy."

The proposed construction of the three uptown Edison stations is the subject of very general discussion in electrical circles. The undertaking is a large one, but the general opinion is that in view of the improvements made lately in methods of distribution, and of the fact that the circuits will be called upon for power by day as well as light by night, the investment ought to be quite as profitable as that, for example, in Boston. Anyhow, the work on three such large stations—the first of which goes up immediately—will make a brisk demand for material and skill, and it may be safely said that the Edison Company was never in better shape for carrying out such ambitious plans. Its personnel was never so good all around as it is now, its organization is in many respects a model, and its management is probably as energetic and far-sighted as any in the country. Few large companies have undergone so marked and radical a change as the Edison in the last three years, and it would be hard to put a finger on any branch or detail of direction in which there has not been an improvement.

W. T. H.

ROCHESTER, July 16, 1887.

The contract has been signed which will make Rochester the best lighted city in the country. All of the gas and oil lamps will be discontinued, and arc and incandescent lights will be substituted. The principal streets and avenues will have the arc lights

of the Brush and United States companies, while the suburban region will be lighted by the Edison Company.

The telephone situation remains practically unchanged. Telephones are being taken out as fast as contracts expire, and as far as can be ascertained very few, if any, new contracts have been taken or old ones renewed. The writing telegraph seems to make slow headway, not over a score of instruments having been put in.

The question of horse, cable, or electricity for street railway use is just now a live topic. The contest is more particularly over one of the principal avenues leading to the south end of the city. The electric people are also looking for a franchise over the boulevard to the lake. There is a strong probability that they will be successful in that direction.

Local electrical firms report good business. An important change has recently taken place in the firm of Schmidt, Kaelber & Co., Mr. Kaelber having been obliged, on account of failing health, to give up his business. His successor is J. C. Kalbfleisch, an energetic young man, who has been for several years connected with the N. Y. C. Railroad. He has considerable reputation as an electrician.

Lee & Zimmerman are pushing their heat regulator, and report that their business is extending very rapidly. They have brought out some new bells, which have considerable merit.

E. C. Bradley has recently taken two large automatic fire alarm contracts in neighboring towns. L.

NEW ENGLAND NOTES.

BRANCH OFFICE OF THE ELECTRICAL WORLD,
BOSTON, July 19, 1887.

On Saturday, July 16, stockholders of the Sun Electric Company of Woburn, Mass., held a meeting at Saco, Maine, to elect a new board of directors.

Mr. G. L. Wiley, of the Standard Underground Cable Company, was in Boston last week, looking after the interests of his company.

The American Bell Telephone Company, at the meeting of its directors on July 13, declared an extra dividend of four per cent., payable Aug. 15 to stockholders of record July 30.

It is now definitely understood that Mr. Howard Stockton will accept the presidency of the American Bell Telephone Company (see ELECTRICAL WORLD, July 16), but it is said that that gentleman will not assume the duties of the position referred to until Oct. 1.

It is reported among the electric light people of Boston that Mr. Frank Ridlon, the N. E. agent of the Brush-Swan Electric Light Company, will soon be elected treasurer and general manager of the Sun Electric Company, of Woburn, Mass.

Dr. Arthur Kemble, of Salem, Mass., has been elected president of the Bickford Railway Electric Company, to fill the vacancy created by the recent resignation of Mr. John P. Peabody.

There is some talk among the members of the Boston Electric Club of having a Sprague motor installed in the premises at No. 66 Boyeston street (headquarters of the club) to run the elevator. The owners of the building will act wisely by complying with the wishes of the club in this matter.

I visited the Boston office of the Ruggles & Randall Mica Company recently, and my attention was invited to some very large and magnificent blocks of natural mica, just as they were taken from the mines. Mr. Randall informed me that his company had equipped its mines with the best machinery that could be obtained for getting out the mica. This company is desirous of doing business direct with manufacturers of electric light dynamos and users of mica. Mr. Randall says: "My company's mica is especially adapted for electrical purposes, it having but slight traces or indications of iron as an ingredient."

The ladies of the Methodist Church in Somerville, Mass., gave a lawn party at the Geldowsky estate on the evening of July 13. They were aided by the Somerville Electric Light Company, which sent a full force of its men to illuminate the grounds. The high trees and shrubbery were hung with variegated colored incandescent lamps, presenting a beautiful appearance, and the walks were lighted by both arcs and incandescents. This was a very commendable act on the part of the electric light company named.

At a recent visit made by the writer to the offices of the New England Wiring and Construction Company, in the "Globe" building, Boston, Manager Walter J. Paine exhibited a neat and novel piece of electrical apparatus patented and manufactured by his company. It is a switch for use in connection with either arc or incandescent lighting, being intended for the perfect control of electric lights from any number of points.

The New England Wiring and Construction Company have completed the stringing of wires for an incandescent plant of 133 lights (Edison system) in the four buildings of the Bradley Fertilizer Company, Boston Highlands. The excellence of the work, notwithstanding the difficulties and obstacles that had to be overcome, entitles Mr. Paine's company to considerable credit. The buildings of the Fertilizer Company are widely scattered, and owing to the chemical processes used the greatest precaution as to the kind of wires used and the manner of stringing same had to be taken. The same company is at present engaged upon wiring and construction work for the following: aiding in the installation of a 500 incandescent Edison plant at Skowhegan, Me., this being a central station for lighting stores and dwellings of that town; also a similar station of 700 incandescent Edison lights at Bellows Falls, Vt., and another of same lighting capacity at Great Barrington, Mass. W. I. B.

PHILADELPHIA NOTES.

PHILADELPHIA, Pa., July 16, 1887.

There are but few things in which Philadelphia does not lead the world. It is three times larger in area than the city of London, it has a public park containing twenty-seven hundred acres, it has some of the largest and handsomest public buildings in America, and it is the one place wherein, within a radius of one mile from its centre, there can be obtained almost every article of manufacture from a needle to a locomotive, made complete on the spot. This city will also very shortly claim the honor of having the largest isolated electric light plant for industrial use in the world. The Baldwin Locomotive Works have signed a contract with the Keystone Electric Light Company of this city, for the installation of a plant of the Westinghouse alternating system with a capacity of 2,700 lights—2,500 of them 16 c. p. lamps—to be distributed through the offices and machine shops; and 200 150 c. p. lamps for the ending shops, the boiler shops and the yards. There will be five dynamos, of an indicated capacity of 600 lights each, although it is stated by the Westinghouse people that with their alternating system they will develop a much greater capacity, and they will be arranged so as to be operated independently or together. Work has already been started on this mammoth plant. The Keystone company have also contracted with the large dry goods house of Strawbridge and Clothier for the erection of a plant with a capacity of 1,000 lights of 16 c. p. and have begun the work of installing it.

With the rapid displacement of gas as an illuminant by electricity, there are being discovered almost daily new and various uses to which manufactured gas can be put, and it seems as though the article will be in as great demand for other uses as it ever was for illuminating purposes. Messrs. A. and P. Roberts & Co. have been experimenting for a year or more with gas as fuel in their extensive iron works at Pencoyd. The Siemens system of producing gas by the slow combustion of coal is used, and the gas has been applied to several furnaces used in heating piles for the rolls. An extensive plant for the manufacture of open hearth steel has just been added to the works, and the furnace, which has a capacity of twenty tons, is heated by gas. The use of gas has been found economical, and a much greater tonnage has been secured from the furnaces than could be gotten by the use of coal. The experiment has worked so well that the firm will probably apply gas to all of the heating furnaces in the works at Pencoyd.

The Electrical Committee of Councils had as their guests on a trip to the Park last Saturday a party of city officials of Boston, consisting of Aldermen W. P. Carroll, J. H. Sullivan and P. J. McGuire; Councilmen T. J. Kelleher, J. B. Gomez, Frank Tuttle and William S. McNary; Clerk of Committees John P. Broley, and Superintendent of the Lamp Department H. J. Tolen, F. A. Gilbert, of the Boston Electric Lighting Company, and M. Meehan, of the Boston Conduit Company.

The party left the office of the Clerks of Councils at noon for a drive through Fairmount Park. They dined at the Falls of Schuylkill in the evening. The object of the visit to this city is to inspect the system of underground electric wires, which is progressing towards completion in this city. The Bostonians are stopping at the Hotel Lafayette. Before their return they will also visit Baltimore and Washington.

The electric light companies which have been making proposals for lighting the Norristown Insane Asylum have met with considerable opposition from some of the trustees, who still pin their faith to gas, and who have ordered a trial of a new style of gas burner to be made, but the electric light will, undoubtedly, triumph in the near future, as many of the trustees favor it.

The Philadelphia Electrical Society, at its last meeting, elected the following permanent officers: President, M. D. Law; Vice-Presidents, John Sager, H. B. Cutter and C. M. Knapp: Recording Secretary, D. R. Gibbs; Financial Secretary, W. O. Snyder; Treasurer, A. F. Reed; Managers, F. W. Griffin, W. McDevitt, A. H. Manwarren, A. Ford and D. A. Curl, to serve one year; W. S. Burleigh, William Roberts and R. J. Park, to serve six months. It was decided to apply for a charter, and the managers were instructed to look about for permanent quarters for the society.

Over 200 new houses have been erected in the vicinity of Twenty-ninth and Thirtieth streets and Girard avenue this summer, and every one of them has been fitted with combination gas and electric light fixtures, electric bells and lighting apparatus. These houses are built to sell and range in price from $1,600 to $3,500. Thus the cheapest houses are now furnished with all the modern electrical appliances.

Inventor John W. Keely has gone to the Catskill Mountains for a two months' vacation. He promises that soon after he returns his motor will begin to mote for certain. The last bit of necessary machinery is now in course of construction, and when this is finished he proposes to give some public exhibitions with the view of forming a new company.

Wm. Wharton, Jr., & Co. expect very soon to have a street trial of their street cars, with storage batteries as the motive power. A visit to their experimental station last week revealed the fact that they have several cars ready for the trials, and there seems to be no question as to the success of the venture.

The Franklin Institute have about completed their arrangements for the establishment of a State weather service, an appropriation having been made by the last Legislature to further the work, and the Institute will contribute enough more to insure its success. It will be a boon to farmers and others in the agricultural districts, as well as to the cities, and it is intended to utilize every available point for the display of the signals. E.

WESTERN NOTES.

BRANCH OFFICE OF THE ELECTRICAL WORLD,
CHICAGO, July 16, 1887.

The following opinion of the Corporation Counsel of Chicago in reference to the power of the city to impose a license upon telephone instruments will be found of interest. This opinion is based, of course, with regard to the laws enacted by the State Legislature, and therefore does not apply to all of the States.

The authorities quoted, and the line of reasoning followed, make the opinion of importance in showing from what direction trouble may be expected. It is understood that this opinion will apply equally well to other electrical corporations.

To the Honorable City Council of Chicago.—GENTLEMEN: In reply to your request I herewith submit my opinion as to the legality of the ordinance submitted relative to licensing telephones.

The general incorporation law authorizes the corporate authorities of the city to license certain trades and occupations. These trades and occupations are specifically enumerated. It does not include in the enumeration telephones. It may be for the reason that the telephone as a system was not in public use at the date of the passage of the act.

When the Legislature in the general incorporation law declares that the corporate authority, organized under said act, shall have power to license certain occupations and kinds of business specifically enumerating them, such declaration may be construed precisely as if the act in express terms inhibited the license of all trades and occupations not contained in the enumeration. This specific enumeration of the power implies the exclusion of all others. [Bross vs. City of Cairo, 101 Illinois, 475.]

Applying this principle to the provisions of the ordinance submitted, the general law by necessary implication denies the right of the council to impose upon the telephone companies a license such as is proposed by the ordinance submitted, for the reason that in no clause of the general incorporation act is there any reference to the telephone system or to any vocation or business similar in character or use.

I am of the opinion that the license cannot be imposed under the exercise of the police power of the city.

Judge Drummond, in the street car cases, held, for the purpose of enabling the parties to take the case to the Supreme Court, that the licensing of street cars was a proper exercise of the police power, and he bases his decision upon the theory that the general incorporation act provided that the city council shall have authority to license hackmen, etc., and all others pursuing like occupations, and he holds under the section specifically enumerating these occupations, "and all others pursuing like occupations," that this was intended as conferring a police power upon the city council in relation to the various clauses named in the statute. And he accordingly held for the purpose of having the Supreme Court decide the case that street cars are of a like nature and character with omnibuses.

Judge Blodgett held that it was not a proper exercise of the police power. In the case of the Chicago Packing company, the right to license was determined under the eighty-first clause of the sixty-second section, where the particular vocation is enumerated, and the police power was exercised for the reason that from the very nature of the business it might prove obnoxious to the health and comfort of the public.

Under the exercise of the police power under legislative authority, unless such appears to have been the legislative intent the law does not give the authority to the council to use the license as a mode for collecting revenue.

Judge Dillon in his work on municipal law says ordinances of this character ought not to be sustained unless the authority be expressly or otherwise unequivocally conferred.

Believing that the power to license is inhibited by the fact that the occupation is not directly or directly or impliedly enumerated in the general incorporation law, and that it is not within the intent or boundaries of the police power, and that it does not come within the spirit or letter of the law authorizing the exercise of that power for the protection of the lives or health of the citizens or the preservation of good order and public morals, I am of the opinion that the ordinance submitted is illegal. This fact disposes of the reasonableness of the license fees. Respectfully submitted,

JOHN W. GREEN, Corporation Counsel.

After reading the above to the Council an ordinance was introduced imposing a tax upon "telephones" of ten dollars each per annum.

The ordinance gets around the Corporation Counsel's opinion by making it a condition precedent to the granting of any rights to telephone companies that said companies first file a statement with the City Collector showing the number of telephones in operation, and requiring the companies to get a permit from the Commissioner of Public Works for operating such telephones, the City Collector's receipt for $10 having to be produced at the time.

The bridge telephones will be in working order by the first of the week. The central office will be on the north side of the river on La Salle street. Prof. Barrett will personally operate them for a few weeks until the practicability of the plan is understood.

My South Bend, Ind., correspondent states that the Common Council have ordered the Central Union Telephone Company to remove all poles, wires, etc., by Aug. 10.

The trouble culminated when an agent of the company endeavored to secure contracts for the toll system, which, the subscribers allege, guarantees the telephone company four dollars per month instead of three dollars, the legal rate. Since July 1 over one hundred and fifty telephones have been removed, leaving about forty in use at present. Several members of the Council have declared their intention of voting to give the franchise to Messrs. D. C. Boley & Co., the agents of the American-Cushman Telephone Company for the State of Indiana.

The American-Cushman Company are active just now. I learn that they have an exchange at Wahpeton, Dakota, with sixty subscribers, and exchanges at Oscoda, Wis., and Findlay, Ohio, with a fair list at each place. They sell an entire set of instruments—telephone, transmitter and magneto bell—for seventy-five dollars, with no royalty. I presume the Bell company will push their suits against these people as soon as the decision from Washington is announced. In order to ascertain the position of the telephone people upon this question, I called upon Mr. Geo. L. Phillips, president of the Central Union Telephone Company. I said: "Mr. Phillips, my reports show unusual activity in the ranks of the American-Cushman people. As you know, they have been selling their instruments outright, doubtless with the intention of evading any penalties the law may impose upon them except by a circuitous litigation. This company are making an effort to secure the South Bend, Ind., franchise. What is the position of your company on this question?"

"Well, you can say that the Bell company will prosecute every individual user of infringing instruments. They will pursue the same course they did at Findlay, Ohio."

I judge from Mr. Phillips' remarks that suits will be instituted wherever necessary to protect the Bell licensees.

Mr. McKinlock, Secretary of the Central Electric Company, has just returned from a prosperous western trip, having secured many large orders for all classes of electric apparatus. He reports the general business of the country very good and the electric interests especially bright and active. The Central Electric Company are a bright and active concern and carry a fine line of goods. They serve their customers with promptness and dispatch, and are fast taking a position in the front rank of older established houses.

A meeting of the Chicago Electric Club was held at their rooms, 223 Dearborn street, last Monday, July 11. About forty members were in attendance. In the absence of the president, Mr. C. A. Brown presided. The proceedings opened with the reading of committee reports upon routine business, after which Mr. Haskins read a short paper upon "Undeveloped Territory," referring principally to marine lighting, as of vessels, docks, etc. The chair called upon Mr. C. O. Mailloux of the Julien Electric Company, of New York, who made a few remarks thereon.

The Chair then read an article clipped from a London newspaper giving the result of a test and exhibition made in that city of the Welsbach gas-lighting system. After a few remarks it was decided to hold the matter over until further information

could be obtained. At the suggestion of Mr. Leonard the discussion turned upon accidents and fatalities caused by the electric current. This subject provoked considerable discussion, which was ably participated in by Messrs. Babt, Warner, Brown and others. It was finally deemed best to ask for a paper upon this subject, and the Chair accordingly requested Mr. Babt to prepare same. The Club then adjourned, every one feeling that the meeting was the most interesting of any yet held.

Mr. E. J. Lawless, superintendent of the Metropolitan Street Railway Company of Kansas City, is on the lookout for a good headlight for cable cars. He favors electricity, provided the cost be reasonable.

Articles of association have been filed with the Secretary of State by the Superior Telegraph & Telephone Company of West Superior, Douglas County, with a capital stock of $3,000. The incorporators are E. E. Barton, P. E. Bradshaw, J. J. Atkinson, O. N. Murdock, C. J. Thomas and H. E. Ticknor. The object is the construction and maintenance of telegraph and telephone lines.

The Thomson-Houston Company for the quarter ending July 1st have established plants for thirty-seven arc-lighting companies, swelling the grand total of local companies using their system to 241 in the United States. This result has been accomplished since Jan. 1st, 1883.

The Bidwell Electric Railway have a car on exhibition at the Exposition Building. The main feature of this system lies in a new form of conduit.

My Kansas City correspondent sends the following:

A recent fire at Leavenworth damaged the Telephone Exchange to the extent of $1,000. They are putting in 2,000 feet of new cable, and replacing 30 miles of old steel wire with No. 12 hard drawn copper. A new line of No. 9 copper is being built from Wichita to Kingman, Kan. A line from Topeka to Wamego is being constructed, and will be in operation about Sept. 1. A new line has just been completed from Kansas City to Lee's Summit, and is now in operation.

The Missouri & Kansas Telephone Company are rebuilding the exchanges at Topeka and Wichita, Kan., putting in 100-wire cables in place of a good many old wires. The central offices are being overhauled, and the capacity of these exchanges increased to accommodate 600 subscribers each, which the company expects to have in the course of the next year.

Subscribers are being added to the Kansas City exchange at the rate of 12 to 15 per day, during the month of July. The hot weather has interfered somewhat with the work; but the prospects are that the month of July will show the largest increase in number of subscribers that the Missouri & Kansas Telephone Company has ever had.

The quarterly meeting of the Board of Directors of the Missouri & Kansas Telephone Company will be held on July 26, when it is expected that the regular quarterly dividend of one and one-half per cent. will be declared.

Col. S. G. Lynch, broker, 146 La Salle street, Chicago, furnishes me the following quotations upon telephone stock:

Bell of Mo.	$155@$157
Central Union	45@ 46
Chicago	385@ 400
Colorado	20@ 22
Cumberland	80@ 85
Great Southern	30@ 33
Iowa Union	25@ 27
Michigan	76@ 77
Rocky Mountain Bell	40@ 45
Wisconsin	105@ 107

C. H. M.

THE TELEGRAPH.

Cuba and Hayti.—Permission has been granted by the Spanish Government to J. R. Vizcarrando to lay down and work a cable between Cuba and Hayti.

Rhode Island.—At a meeting of the stockholders of the Baltimore & Ohio Telegraph Company of Rhode Island, held at their office at No. 19 Weybosset street, Providence, July 11, the following board of directors were elected for the ensuing year: D. H. Bates, E. A. Leslie, J. W. Larish, C. J. Sheehan, F. A. Osborne.

A Jubilee Dinner.—Arrangements have now been made in England for the celebration of the jubilee of the telegraph. A dinner will be given on July 25, under the auspices of the Society of Telegraph Engineers, in the Venetian Room of the Holborn Restaurant, London. A general committee of distinguished electricians has been formed to make arrrangements, and a guarantee fund of $500 to meet incidental expenses has been raised. It is expected that 300 or 400 electricians and their friends will be present.

THE TELEPHONE.

Chambersburg, Pa.—The American Bell Company has taken steps to stop the use of infringing apparatus at the above place.

N. T. E. A.—General Barney announces that the ninth annual meeting of the National Telephone Exchange Association will be held at Pittsburgh, beginning Monday, Sept. 26. Further arrangements will be announced later.

The Telephone in the Theatre.—At the Theatre National, in Rome, some new experiments have recently been made in the way of telephonic transmission, under the direction of the Rome Telephone Company. The best results have been obtained by means of a microphone, the conductors of which are placed in the focus of a parabolic reflector, and the transmitters are placed under the columns of the first row of boxes. During a recent representation of "I Puritani" an excellent transmission was had of solos, choruses and orchestration.

Gray and the Telephone.—A special dispatch of July 14th from Washington says: Mr. Frank P. Brown, principal examiner in electricity in the patent office, has submitted to the commissioner his report on the request of Elisha Gray for leave to amend the claim in his application for a patent for the speaking telephone, by inserting the word "metallic" before the word "diaphragm," in his original claim. Argument was heard in the case May 24, 1887. Mr. Brown decides adversely to such amendment, holding that it is excluded by the decision in the original speaking telephone interference case, and that its subject matter has been abandoned by Gray.

The Telephone in Mexico.—A charter has been granted the Mexican Telegraph and Telephone Company, recently organized in Nashville, Tenn., for the purpose of controlling and operating patents owned by them in the Mexican Republic. Late advices from the president of the company, Mr. B. F. Moore, and Judge Lepulvida, their attorney in Mexico, state that they have assurances from the Mexican Government of its patronage and protection, and the granting of certain concessions, such as the importation of instruments and material free of duty. Several Memphis men and prominent Mexicans are interested in the success of the enterprise. They are operating under J. Harris Rogers's patents. T. C. Looney, vice-president of the company, has started for Mexico with apparatus.

THE ELECTRIC LIGHT.

Webster, Mass.—The plant of the Webster Electric Company is to be in operation by November 1.

New Bedford, Mass.—The New Bedford Electric Lighting Company has declared a quarterly dividend of 2 per cent.

The Hartford Dynamic Company has been incorporated at Hartford, Conn., by C. K. Wead and others, with a capital stock of $20,000.

Sharpsburg, Pa.—The Sharpsburg Electric Light Company, of Sharpsburg, Allegheny County, has been chartered with a capital stock of $100,000.

Galveston, Tex., will have a large Westinghouse alternating plant, the contract for which has been closed by Mr. J. Holt Gates on behalf of the Westinghouse Company.

Hot Springs, Ark.—The Hot Springs Electric Light Company has been formed by E. Hogaboom, E. F. Klein, W. A. Eisele, W. W. Wright and J. W. Coyles, with a capital stock of $50,000.

Tallapoosa, Ga.—The Tallapoosa Electric Light Company has been organized by R. L. Spencer, A. I. Head, H. C. Dean, A. J. McBride, G. W. Hull and others, with a capital stock of $10,000.

Hyde Park, Ill.—The Economic Electric Light and Gas Company has asked the Board of Trustees for the right to string wires in the northern portion of the village for electric lighting purposes.

Jamestown, Dak., with a population of 3,000, and growing, will grant a ten years' exclusive electric lighting franchise. Full information can be obtained from Mr. J. M. Graham, the mayor of the city.

Salt Lake City.—The electric lighting station at Salt Lake City, Utah, will be hereafter managed by the Salt Lake City Gas Light Company, the latter having purchased a controlling interest in the former.

The Sperry Company.—The Sperry Electric Company, of Chicago, has been incorporated as a manufacturing company by Edw. Goodman, Jno. S. Marshall and Jos. R. Smith, with a capital of $250,000.

Americus, Ga.—Mention has already been made of the proposal to put in an electric light plant at Americus. Dr. I. B. Nemkle is said to be contemplating the use of the light for city and private purposes.

Newport, Ky.—The Kentucky Electric Company, in which Mr. Julius Balke is the largest stockholder, has been given the right to operate for electric lighting purposes at Newport, Ky. The capital stock is $200,000.

An Increase of Stock.—The Thomson-Houston Electric Company has increased its capital stock from $125,000 to $250,000. Even at the new figure, the capitalization is very modest in view of the large business done.

St. John, N. B.—The St. John Gas Light Company has a Thomson-Houston arc plant in use, comprising one 20, one 25, two 30, and one 50 light dynamos, engaged in private lighting at the rate of 35 cents per night per light.

Grand Rapids, Mich.—The Edison Light and Fuel Gas Company, of Grand Rapids, Mich., have purchased property at corner of Calder and Fulton streets, that city, on which they will erect a large building to cover the entire block.

San Francisco, Cal.—The Rae Electrical System Company of San Francisco, Cal., has been incorporated with a capital of $1,000,000. Messrs. Julio H. Rae, Julius Jacobs, A. P. Brayton, Wm. Alvord and Geo. C. Perkins are corporators.

York, Pa.—The city councils have instructed the light committee to inquire into probable cost of erecting and maintaining an electric light plant for the use of the city. Information on the subject is desired by the chairman of the committee.

In a Country House.—An isolated plant has recently been installed at the country house of Mr. James A. Wright, near Philadelphia. It consists of 100-light Edison machine, an 8 h. p. vertical New York Safety Steam Power Company's engine, a vertical 15 H. P. tubular boiler and 110 cells of the Electrical Accumulator Company's 15 A type, connected up two in series. The batteries are charged 4 hours weekly. Standard Edison 106 volt 16 c. p. lamps are used. The plant has now been in operation about a month.

Alameda, Cal.—Through Mr. Brainard Rorison, its secretary and manager, the Jenney Electric Company of Indianapolis has sold to the city of Alameda the 120 arc light plant established there last fall by Mr. C. R. Lloyd, the company's agent. It is said that the consideration is $40,000. The Indianapolis Jenney system is also in use at San Diego and San Bernardino.

Ridley Park, Pa.—As was stated recently the Ridley Park Electric Light and Power Company has been incorporated by Mr. R. Craven and others with a capital stock of $10,000. At the present time a little more than half the stock has been subscribed, but no contract has been made yet or work done on the plant. It is proposed to place all the 400 shares of stock before actually beginning work.

West Point, Va.—An electric light company was formed recently at West Point, to be known as the West Point Light and Power Company. Its capital is $25,000. It has contracted with the Thomson-Houston Company for its plant, and will start with about 300 incandescents in service. Contracts have not yet been made for the steam equipment, but it is expected to have the station in operation by Sept. 15.

Springfield, O.—The Champion Electric Light Company of Springfield, O., has four Thomson-Houston 30-light dynamos in use for street and commercial lighting. It gets $130 per light per annum for city street lights, the lights being run all night and every night. Commercial lights average $11.25 each per month run till midnight. The company is now building a new station, with a capacity of 180 arcs and 1,400 incandescents. The motive power will consist of four Westinghouse 75 h. p. engines. The company is now using crude petroleum for fuel with perfect success, and is saving 20 per cent. on the cost of coal at present prices. Mr. W. A. Scott is secretary of the company and Mr. A. L. Slager manager.

Austin, Tex.—We gave details last week of the organization and plans of the Austin Light, Power and Water Company, whose plant will consist of 120 Brush arc lights and 3,900 Westinghouse incandescents on the alternating system. The circuits will be wired for 6,000 incandescents. Lamps of 25 c. p. will be employed for street work. Electric motors are also to be supplied and run by the company. The station will be 42 feet × 49 feet, with ceilings 20 feet in the clear. The boiler room will be 40 feet × 40 feet. There will be four 100 h. p. boilers, in addition to which steam pipes will connect with three boilers in the waterworks, thus making a battery of seven boilers, and 700 horse power. This is only one-half of the steam power that is proposed to be put in when occasion requires. There will be two 150 h. p. engines; one of 75 h. p. and two of 35 h. p. each.

APPLICATIONS OF POWER.

Springfield, Mass.—The United Electric Light Company are putting in Sprague motors, and will soon have ten in operation on a motor circuit, ranging from 3 up to 10 h. p.

Cleveland, O.—The Brush Electric Light and Power Company has in use on its arc circuits two 2 h. p. Brush motors and two 1 h. p. Cleveland, used for sawing, printing, paper cutting, etc.

Toledo, O.—The Toledo Electric Company has just gone into the motor business. It now has eight ⅛ h. p. motors in use on arc and incandescent circuits, running ventilating fans, and dental lathes.

Portrush, Ireland.—The Portrush electric tramway, which has been running so successfully for three years past, has now been extended from Bushmills to the Giants Causeway, and the new section is already in operation.

Kansas City, Mo.—The Kansas City Electric Light Company has on its arc circuits twelve C. & C. ⅛ h. p., ¼ h. p. and one h. p. motors, running jewelers' lathes, drills and burnishers, and sewing machines. The service is reported satisfactory.

Reading, Pa.—The Reading Electric Light and Power Company is making a start in the use of motors on incandescent circuit. It now has one ⅛ h. p. C. & C. motor running a dental engine, and is putting in a 5 h. p. Sprague motor to run a job office printing press.

Motors for the South.—It has been rumored that the Van Depoele Electric Manufacturing Company, of Chicago and New York, proposes establishing a branch factory for electric motors at Montgomery, Ala., where 150 men will be employed. The report is denied, however.

Harrisburg, Pa.—The Harrisburg Electric Light Company has now four electric motors in use, one ⅛ h. p., one 3 h. p. and one 5 h. p. Sprague and one ⅛ h. p. C. & C. These are on incandescent circuits, and operate printing and book-binding machinery. They give general satisfaction.

Cincinnati, Ohio.—The Brush Electric Light Company, L. H. Weissleder superintendent, is hard at work getting its service back into its original shape as before the recent fire. The disaster has not prevented it from trying the motor business, and it now has one 4 h. p. and one 2 h. p. Brush motors in use, driving presses and ventilating fans.

West Chester, Pa.—The Edison Illuminating Company has gone quite extensively into the motor business. It now has in use on its incandescent circuit four ⅛ h. p., one 1 h. p., two 2 h. p., one 7½ h. p. Sprague motors and forty C. & C. ⅛ h. p. motors. The 7½ h. p. motor operates a machine shop, and others are at work on printing presses, sewing machines, etc.

Lowell, Mass.—The Middlesex Electric Light Company has lately gone into the motor business, and has already installed three 1 h. p. and one 3 h. p. Thomson-Houston motors on its incandescent circuits. Two are used for freezing ice-cream, with fan attachment, and one furnishes power for blowing an organ. The company has on hand orders for 30 h. p. of motors, to be filled as soon as possible.

Pittsburgh, Pa.—The Allegheny County Light Company now has about 30 electric motors in use, ranging from ⅛ h. p. to 10 h. p., of the Sprague, C. & C., Van Depoele, Brush, Daft and Baxter make. Some are on arc and others are on incandescent circuits, driving fans, sewing machines, elevators, etc. The company is about to put in a motor of 15 h. p. to drive dynamos for the Western Union Telegraph Company.

The Fulton Street Electric Road.—Commenting in the daily papers on the note published by Mr. J. B. Vroom, Denver, Col., and alluded to by us, on the troubles that arise from "car slipping," Col. R. R. Hazard writes: "He observes that a street car company expects to use "the electric storage battery" as a motor on Fulton street. He then proceeds to "predict" that in New York, where there is much moisture, the driving wheels of the electric cars will slip during freezing weather, the weight of the load over them not being sufficient, and that "sanding" the track will not remedy the trouble. Mr. Vroom is misinformed. The North and East River Railway will be equipped with motors attached to cars driven from a central station. Whatever the future of the "storage battery" as a means for propelling street cars may be, it is in the early experimental stages at present. As a matter of fact the Bentley-Knight motor car has been in use for

two years, successfully overcoming the difficulties which Mr. Vroom describes, and therefore there is not the slightest doubt of the successful operation of the road. The equipment is being manufactured as rapidly as possible, and will be laid and the road completed at the earliest possible date. The people of New York can then see for themselves for the first time what a perfect system of street passenger tramway is."

PERSONALS.

Mr. John Beattie, Jr., the inventor of the Beattie zinc and other electrical appliances, is writing a series of articles on electricity for the Fall River *Daily Herald*, giving not only historical information, but a good deal of practical data.

Mr. Theodore N. Vail is already interested in a large number of important enterprises, and now appears as one of the incorporators of the New York Heating Company, the object of which is to furnish heat by means of hot water, steam, gas, electricity and other agents.

Professor Fujioka, of the Japanese College of Engineering, who was recently in this country, has made a report on the Van Rysselberghe system of simultaneous telegraphy and telephony, and expresses the opinion that the system is well adapted for use on the principal lines of the country.

Mr. J. J. Carty, whose intelligent work in connection with the multiple boards at Boston is well known to telephonists, has resigned his position as superintendent of the operating room there for the New England Telephone and Telegraph Company, and on August 1 will join the forces of the Western Electric Company and fill a sphere of wider usefulness.

Mr. Park Benjamin, in a recent number of the *Forum*, discussed the subject of execution by electricity, in the course of which he dwelt very forcibly on the effect that the carrying out of the death penalty by electricity will have on the popular imagination. He said: "From the very earliest ages superstitions of almost every conceivable form and character have clustered about the lightning stroke, and many of them still survive. It is not difficult to conceive that the instant extinction of life in a strong man by an agency it is impossible to see, which is unknown, may create in the ignorant mind feelings of the deepest awe and horror, and prove the most forcible of all means for preventing crime."

Mr. Howard Stockton.—Speaking of the proposed succession of Mr. Stockton to the presidency of the American Bell Telephone Company, the Boston *Traveler* says: Mr. Stockton is a lawyer of ability, and the treasurer of the Cocheco, Salmon Falls, and Essex manufacturing companies. He has held these latter positions for some time, and is well-known in Boston business circles as a man of excellent judgment and high executive ability. He has for a long time been a large holder of Bell telephone stock, and has always taken an active interest in the affairs of the corporation. In assuming the presidency of the company, he proposes to pursue, in every particular, the present policy of the management, and no changes in any department are contemplated. As matters now stand, Mr. Stockton will take his new position just as soon as Mr. Forbes and the board of directors can make certain necessary arrangements, or some time by or before Oct. 1.

MISCELLANEOUS NOTES.

Electric Pads.—The Indian Herb and Electric Pad Company, of New York, has been incorporated by J. J. Gallagher and others, with a capital stock of $5,000.

The Card Electric Brake.—Messrs. G. F. Card, H. K. Lindsey, Geo. W. Howell, Thomas F. Corry, W. A. Detrick, W. H. Mackoy and others have incorporated the Card Electric Brake Co., at Covington, Ky., with a capital stock of $1,000,000.

Winding Magnets.—In our issue of May 7, 1887, page 214 we reprinted a formula for calculating the diameter of the wire to fill a given bobbin, in which there is a typographical error. The quantity in parenthesis $(A - a)$ should read $(A^2 - a^2)$, which can readily be shown by deducing the formula. We call the attention of our readers to the fact that the same error exists in that formula as published in *Monroe & Jamieson's Pocket Book*, page 402, third edition.

BUSINESS NOTICES.

Jordan & Gottfried, 208 Canal St., N. Y., carry a complete stock of iron and brass machine and wood screws, bolts, cap and set screws, taps, dies, files, twist drills, brass and rubber in tubing, rod and sheet copper, brass, German silver, steel and iron wire, shafting, tools, etc.

Cincinnati, O.—Sebastian, May & Company, well known as manufacturers of foot and power lathes, drill presses, etc., have now secured larger quarters in the four-story brick building 187-89-91 West Second street, corner of Plum, Cincinnati. This building has been specially erected by the concern, and furnished with all the latest and most improved machinery. The move was necessitated by the constant and increasing demand for the tools made by the firm—a demand which has far exceeded its expectations, and continues unprecedently brisk. A line of the firm's specialties will be carried in stock.

Mica.—The Ruggles & Randall Mica Company, 26 Union Street, Boston, Mass., have become successors to the business of C. L. Randall, miner and dealer in mica, and are now prepared to furnish the article in all sizes. They have equipped their mines with all the latest appliances for quick supply, and will fill any order without delay. This mica, which has awards from 17 States of the Union, is particularly useful for electrical purposes, having but slight traces of iron in its composition.

The Armington & Sims Engine Company.—This company has been long cramped in its present quarters at Providence, the growing demand for its well-known engines having far exceeded its facilities. The company now makes the announcement that it has purchased the Monohassett Mill property, whither it will remove as soon as possible. Its plant will there be largely increased, and the effort will be made to keep pace with orders. The success of the company is among the triumphs of American engineering, and this evidence of its growth and prosperity will be universally viewed with pleasure.

STOCK QUOTATIONS.

The following list, compiled by Mr. W. H. Baker, member New York Stock Exchange, 16 and 18 Broad street, gives the current quotations of electrical stocks:

July 19, 1887.

TELEGRAPH.	Bid.	Asked.
Am. Dist.	25	35
Am. Tel. & Cable	74¾	75½
Cen. & So. Am.	100	110
*Com. Tel	102	103
*Gold & Stock	.....	.....
*Inter. Ocean Tel.	.....	.....
N. Y. Mutual	76	80
Pac. & Atl.	45	55
*Postal T. & C.	25	35
South. & Atl.	70	78
W. U. Tel.	76½	76⅝
W. U. Scrip.	75	.....
W. U. Bonds	116½	.....
Mut. U. Bonds	86⅛	86¼
TELEPHONE.		
Am. Bell	220½	221
Am. Speaking	110	120
Erie	32¾	33¼
*Hudson River	.....	60

TELEPHONE.	Bid.	Asked.
Mexican	.....	1½
*N. Y. & N. J.	87	92
N. Y. & Pa.	.....	.....
New England	43	45
*Southern Bell	125	135
ELECTRIC LIGHT.		
*Am. Electric	.....	.....
*Brush	.....	.....
*Brush Ill.	90	100
*Consolidated	.....	.....
*Daft	.....	.....
*Edison	.....	230
*Edison Ill	98	102
*Edison Isolated	.....	.....
*United States	40	50
*U. S. Ill.	90	95
MOTOR.		
*Daft	.....	.....
*Sprague	.....	.....

* These stocks are so seldom dealt in that it is difficult to give prices at which they can be bought or sold. The figures given are as near as can be ascertained.

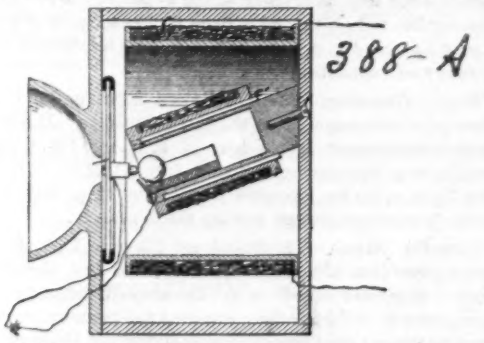
OUR ILLUSTRATED RECORD OF ELECTRICAL PATENTS.

PATENTS DATED JULY 5, 1887.

(1) 365,776. (2) 365,777. (3) 365,778. (4) 365,779. (5) 365,780. (6) 365,781. Telephone Transmitter; J. W. Bonta, of Philadelphia, Pa., Assignor to the American National Telephone Co., of New York. Applications filed (1, 2 and 4) Oct. 21, 1886, and (3, 5 and 6) Dec. 21, 1886. (1) The rolling electrodes and the inclined plane are located within the bore of the primary coil of the inductorium to make the transmitter more compact. The diameter of the coils of the secondary of the inductorium is increased and the secondary is separated more or less from the primary, which has the effect of producing in the secondary more intense impulses for transmission to line. See illustration. (2), (3), (4), (5), (6) Improvements in the form and arrangement of the electrodes.

365,792. Apparatus for Measuring Electricity; J. Cauderay, of Paris, France. Application filed July 7, 1886. The object of the invention is to produce an apparatus capable of measuring the quantity of electricity supplied by an alternating current where the existence of a permanent magnetic field is not admissible.

365,798. Angle Hanger for Mechanical Telephone Lines; A. W. S. Davis, of Lowell, Mass., Assignor to Frederick Taylor, of same place. Application filed Oct. 18, 1884.



365,776. TELEPHONE TRANSMITTER.

The device is to lessen the vibrations caused by atmospheric disturbances.

365,842. Electric Cartridge; E. A. Monfort, of New York, Assignor, by mesne assignments, to the Universal Electric Arms and Ammunition Company, of same place. Application filed Jan. 13, 1883. The cartridge is to be used in ordnance and small arms. The charge is exploded by a current of electricity which heats a fine platinum wire extending into the cartridge chamber. See illustration.

365,868. Mechanical Telephone Switch; G. F. Shaver, of New York, Assignor to Benj. P. Wheeler, of same place. Application filed Sept. 20, 1886. Details in the construction.

365,911. Police Telephone System; W. H. Eckert and J. A. Seely, New York, N. Y. Means for telephonic communication between policemen on duty and headquarters.

365,925. Electro Magnetic Annunciator Drop; J. J. O'Connell, of Chicago, Ill. Application filed March 14, 1885. A simple arrangement of drop and armature.

365,978. System of Electrical Distribution; T. A. Edison, Llewellyn Park, N.J. For description see page — this issue.

365,982. Transmitter for Printing Telegraphs; Stephen D. Field, of New York, Assignor to himself and John Anderson, of same place. Application filed Dec. 5, 1885. The transmitter does not act directly to open and close circuit or reverse currents, but it operates a valve which controls a fluid under pressure, and the fluid, through piston mechanism, operates the circuit controlling devices. See illustration.

365,994. Printing-Telegraph; C. L. Healy, of Brooklyn, Assignor to the Commercial Telegram Co., of New York, N. Y. Application filed Feb. 9, 1886. Just before the printing relays are short circuited a large resistance is thrown in so as to prevent the injurious flow of current through the local circuit,

365,842. ELECTRIC CARTRIDGE.

which is due to the cutting out of the numerous relays, when the relays have a common shunt. See illustration.

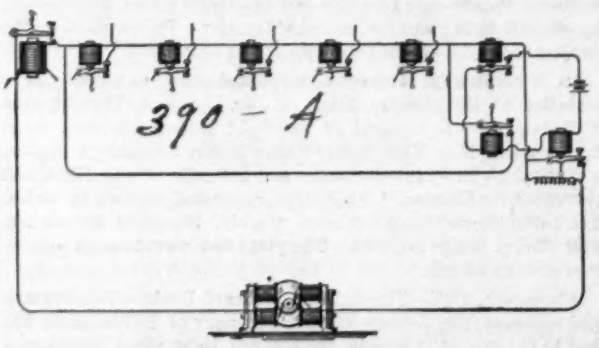
366,021. Electro-Magnetic Motor; H. M. Paine, Newark, N. J. Application filed Feb. 19, 1886. Novel details in the construction.

366,034. Galvanic Battery; C. Seiler, Philadelphia, Pa. Application filed Nov. 19, 1886. Means for raising and lowering the electrodes in the trough and a commutator and cell-selector whereby the cells can be connected up for quantity or intensity or both.

366,058. Electric Belt; R. E. Williams and T. G. Hammer, of Dallas, Texas, and New Orleans, La., respectively. Application filed Jan. 24, 1887. Structural details.

366,124. System of Electric Distribution; J. F. McElroy, Lansing, Mich., Assignor of one-half to L. C. Butler, of same place. Application filed Feb. 3, 1887. An arrangement whereby a lamp or group of lamps may be controlled by two manual switches, one at the lamp and the other distant therefrom.

366,154. Signal Box; H. A. Chase, Stoneham, Mass., Assignor to the Municipal Signal Co., of Portsmouth, N. H. Application filed Aug. 31, 1886. A box for municipal signaling wherein a key is used and carried by certain parties. The insertion of the key turns in a corresponding signal.



365,994. PRINTING TELEGRAPH.

366,164. Electrolytic Vaporizer for Medicinal Purposes; M. W. Gillam, Philadelphia, Pa. Application filed May 29, 1886. An apparatus in which a volatile medicinal compound is subjected to a current of electricity to create fumes which are conducted to the nostrils or other part of the body.

366,166. Printing Telegraph Transmitter; C. L. Healy, Brooklyn, Assignor to the Commercial Telegram Company of New York. Application filed Feb. 1, 1887. The object is to construct the key-board so as to increase the facility of transmission.

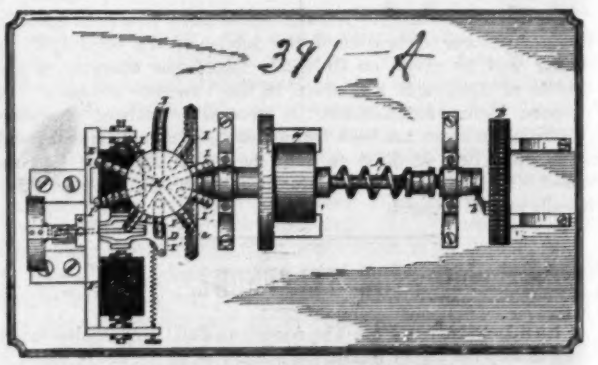
(1) 366,173. Junction Box for Electric Conductors; (2) 366,174. Electrical Conductor; J. Kruesi, Brooklyn, Assignor to the Edison Machine Works, of Schenectady, N. Y. Applications filed respectively Aug. 5, 1882, and Jan. 4, 1883. (1) Structural details. (2) The conductor is a bundle of wires bound together by tape or other wrapping. It is covered by a metallic tube of larger diameter than the conductor, and the conductor is held centrally in the tube by a spirally wound cord.

366,178. Printing Telegraph Receiver; H. Mahnken and C. L. Healy, of Brooklyn, Assignors to the Commercial Telegram Co., of N. Y. Application filed Feb. 1, 1887. The object of the invention is an improved type wheel movement and an arrangement of the inking rollers.

366,190. Electric Telephony; A. G. Safford, Washington, D. C., Assignor of one-half to L. L. Bellock, of Oakland, Cal. A series of reeds are placed opposite a like number of electro-magnets. For description see page 40 this issue.

366,192. Polarized Relay; G. T. Woods, Cincinnati, O. Application filed Nov. 3, 1886. In relays adapted for railway induction telegraphy a construction is provided to prevent injury to the relay by jarring.

366,184. Electric Rock Drill; L. J. Phelps, New York, Assignor to C. A. Cheever, trustee, same place. Application filed Dec. 31, 1885. A motor is mounted on a tripod and the drill is attached to a crank keyed to the motor shaft.



365,982. TRANSMITTER FOR PRINTING TELEGRAPH.

366,176. Thermotic Circuit-Closer; J. C. Mackey, Phœniz, N. Y. Application filed Aug. 12, 1886. Heat melts the support of a circuit-closer and allows it to fall and complete the circuit.

365,843. Electrical Breech-Loading Fire-Arm; E. A. Monfort, New York, N.Y., Assignor, by mesne assignments, to the Universal Electric Arms and Ammunition Company, of same place. Application filed Nov. 18, 1882. This arm is to be used for firing the cartridge described under No. 365,842.

365,787. Electric Block System for Pneumatic Dispatch; A. Bryson, Jr., and H. S. Mudge, Brooklyn, N. Y. Application filed Feb. 26, 1887. The gate controlling the air passage is operated by an electro-magnet which is in circuit with the conductor, which runs parallel with the tube and in contact with the moving carrier.

Copies of the specifications and drawings complete of any of the patents mentioned in this record—or of any other patent issued since 1866—can be had from this office for 25 cents. Give the date and number of patent desired, and address Johnston's Patent Agency, Potter Building, New York.